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THE PROGRESS AND PROBLEMS OF MILK RECORDING.

By JAMES MACKINTOSH, N.D.A., N.D.D. (Lecturer and Adviser in Dairy Farming, University College, Reading).

Numerous articles have appeared in past numbers of this Journal on the subject of milk records, explaining in greater or lesser detail the various methods by which reliable records of the milk yield of cows can be kept, and describing the numerous advantages which follow the adoption of this important improvement in dairy herd management. It is, nevertheless, a regrettable fact that, in spite of oft-repeated exhortations to keep milk records, the dairy farmers of England have been notably slow in taking up this work. Progressive farmers here and there throughout the country have kept private records for many years, but the keeping of records on the co-operative or society basis has never become such a popular movement as has been the case in the south-west of Scotland in recent years. The proverbial hesitation of the English farmer to adopt a new idea and apply it to his own conditions—especially where the carrying out of the idea involves arithmetic and book-keeping—may account partially for the slow advance of milk recording, but doubtless part of the delay is attributable to the lack of a sound scheme specially drafted to meet the varied conditions of English dairy farming—a scheme based on a few sound principles which could be universally adopted, but also elastic enough in detail to meet the varying conditions of cheesemaking and milk-producing districts, and of pedigree and commercial dairy herds.

Many minds have been at work during recent years trying to devise a suitable scheme, and it is only just that the patient labour of committees of the British Dairy Farmers' Association, the different societies of the specialised dairy breeds, and the pioneer work of several Agricultural Colleges and County Councils should be recalled to mind in this respect. But it became increasingly clear that no scheme could hope for general acceptance and success throughout the country unless it had the sanction of a national authority and the power to give grants in aid to local societies. Such a scheme was finally brought out by the Board of Agriculture as part of the national work of live stock improvement inaugurated by the Development Commissioners.

Experience has shown that it would have been unwise to have adopted wholesale in England a scheme which had been found most suitable in another country, and the years of delay which have been

mourned over by so many enthusiasts may yet be found to be not so regrettable, if it be made evident that the English national scheme, profiting by experience, has avoided the mistakes of the schemes of other countries, and, by taking as a foundation a few essential principles, but allowing a regulated elasticity in details, proves that it can be easily adapted to the varied conditions under which milk production is carried on in England and Wales.

Any statement of the progress which has been made in milk recording in Great Britain and Ireland may easily be misunderstood and misinterpreted unless it is accompanied by a description of the conditions under which the work is carried on. The writer, therefore, has attempted to give below a concise statement of the chief points of the other national schemes.

SCOTLAND.

Systematic milk recording on a public basis (as contrasted with the keeping of private records) was commenced in Scotland in 1903, under the auspices of the Highland and Agricultural Society of Scotland, and largely as the result of the strenuous and untiring advocacy of the late John Spier.

At the end of 1907 the control of the work in Scotland was transferred to a special body termed "The Ayrshire Cattle Milk Records Committee," as it was felt that the dairy farmers should have the control of the work in their own hands. An annual grant of £200 was awarded the committee by the Highland and Agricultural Society. In 1910 the name of the controlling body was changed to "The Scottish Milk Records Committee," as it was recognised that all milk recording in Scotland should be conducted on a common system and by one administrative body, and that all breeds of dairy cattle in Scotland should have their interests attended to by delegates on the central committee. In 1912 the committee received a grant of £900 on agreed conditions from the Development Commissioners through the West of Scotland Agricultural College, and a supervisor of milk recording was appointed. In 1914, in accordance with a scheme approved by the Scottish Board of Agriculture and the Development Commissioners, the Committee was reconstituted as "The Scottish Milk Records Association," and an annual grant of not more than £2,000 was obtained from the Development Fund.

While the general administration of the milk record work in Scotland is in the hands of the Executive Committee of the Association, the local work is carried on by "local societies," which usually consist of from 15 to 24 members. Each local society in 1914 received a grant from the association according to the following scale:—

- (a) To societies in their first year : An annual grant of £35 and the hire of the necessary milk-testing appliances free of annual charge, the society to upkeep the apparatus in good condition.

- (b) To societies in their second year : An annual grant of £35.
A full grant to be given for tests at intervals of not more than 21 days ; 75 per cent. thereof for tests at intervals of from 21 to 28 days ; no grants to be given where the intervals between the tests exceed 28 days.

- (c) To older societies : An annual grant of £10.

The funds required, in addition to the above grant, to maintain a local society may be raised by one or more of the following methods : (a) by an annual membership subscription, (b) by a proportional charge to be levied on each member, (c) by a charge per cow tested, (d) by any other method approved by the society.

The sheets and books required for the recording of the weight and fat percentage of the milk, and of the feeding-stuffs supplied to the cows, are provided by the association, and the details of the work must be carried out in accordance with the rules and regulations, and the instructions to milk recorders approved by the association, which are here summarised briefly :—*

Each local society employs a recorder, who must be approved by the association, and who must visit each farm in rotation ; the length of the interval between visits depends on the number of members in the society, and is usually from 19 to 28 days. The farmer usually provides accommodation overnight for the recorder, and is aware of the date when each visit is due. The weighing of the milk need only be done on the evening and morning of the recorder's visit. Samples are taken of the milk of each cow in the herd, and butter-fat tests carried out at each visit. Each cow included in the records must be clearly distinguished in the byre by a stall number on the wall in front of or above the level of the cow, and all particulars regarding the pedigree, age, dates of calving and services, &c., for each cow must be entered in the proper place in the record books. The weight of milk and percentage of butter-fat obtained at any visit is taken as the average for a period of which the day of visit is regarded as the middle day ; i.e., if the period between visits is 21 days, the results obtained at any visit are taken as the average of the 10 preceding and 10 succeeding days. At each visit the recorder must make as accurate an estimate as possible of the total foods of all kinds given to each cow daily, and must calculate the cost of food per cow at specified rates for home-grown foods, and cost price for cakes and meals.

* *Full details of the work and methods of the Scottish Milk Records Association can be obtained in the Annual Report issued by the Secretary, Alloway Street, Ayr.*

The development of the work in Scotland has been very rapid after the first three years, and the following table shows the rate of progress from 1903 to 1914 :—

PROGRESS OF MILK RECORDING IN SCOTLAND.

| Year. | Number of Societies. | Number of Herds Tested. | Number of Cows Tested. |
|-------------|----------------------|-------------------------|------------------------|
| 1903 | 3 | 34 | 1,342 |
| 1904 | 1 | 12 | 389 |
| 1905 | 2 | 30 | 815 |
| 1906 | 5 | 76 | 2,688 |
| 1907 | 7 | 109 | 3,931 |
| 1908 | 13 | 193 | 8,132 |
| 1909 | 13 | 212 | 9,202 |
| 1910 | 13 | 217 | 9,514 |
| 1911 | 18 | 333 | 13,965 |
| 1912 | 24 | 438 | 18,356 |
| 1913 | 32 | 581 | 22,816 |
| 1914 | 36 | 641 | 26,424 |
| 1915 | 36 | 641 | 26,500* |

IRELAND.

The formation of Milk Record Societies in Ireland followed the introduction of the Department of Agriculture's Scheme for establishing a register or herd book of Irish dairy cows. This scheme came into operation in 1906, and under it many farmers were induced to keep systematic records of their best cows in order that these cows might be entered in the register. Since 1912, the minimum yield for entry has been a yield during one milking period of not more than 45 weeks, of at least 210 lbs. butter-fat, with a calculated average percentage of butter-fat of not less than 3 per cent., nor a calculated yield of milk below 6,000 lbs. Up to 1915, a total of 2,311 cows had been entered in this register.

The first milk-recording society (or cow-testing association) established in Ireland under the scheme of the Irish Department of Agriculture was formed in 1909, and the chief points of this scheme are given below† :—

Associations are divided into two classes—Class A, where a whole-time supervisor or recorder* is not required because the herds are widely scattered; Class B, where the number of cows and other circumstances warrant the employment of a whole-time supervisor. Associations desiring to be recognised by the Department must apply on prescribed forms and undertake to comply with the regulations laid down by the Department. No association can be recognised in

* *Estimated numbers.*

† *For full details see Scheme No. 20 issued by the Department of Agriculture and Technical Instruction for Ireland: also "Cow Testing and its Advantages," (Journal of the Department. Vol. XVI. No. 1.)*

Class A unless milk records for at least 100 cows, and in Class B for at least 200 cows, are kept by its members throughout the entire milking period. Associations in each class must appoint competent supervisors, whose duties shall be to ensure that the weekly records are properly kept, to carry out regularly the monthly butter-fat tests, to enter the results of these monthly tests, &c., on the proper forms, to investigate and check all cases of abnormal weights and tests, and to supply other information to the Department. In Class A, the Associations are mostly formed in connection with creameries, the manager of the creamery being usually appointed supervisor. In Class B, the Associations must each employ a whole-time supervisor, who must visit each farm at least once a month to see each cow milked (morning and evening), check the weighing and recording of the milk, take a composite sample of the morning and evening milk of each cow, and test the sample for butter-fat. All members of Associations in both Classes must weigh the milk of each cow every seventh day (the exact day being fixed by each Association) and the morning and evening milk must be weighed and recorded separately. Also, each member must furnish a list of all his cows, and pay to his Association 1s. per cow per annum.

When the Department of Agriculture are satisfied that suitable arrangements have been made for complying with their requirements, they will supply the Association with the necessary record forms and, when satisfied that all conditions have been met, will contribute for one year at the rate of 2s. per cow towards the cost of employing a supervisor in Class A associations. In Class B, the Department will refund to each association, provided the amount does not exceed 2s. per cow, two-thirds of the remuneration paid to the supervisor. For the purposes of this scheme, the term "milking period" shall mean the period during which a cow continues to yield milk after calving, provided that, if such period exceeds 45 weeks, the first 45 weeks after calving shall be regarded as the cow's milking period.

Since 1909, considerable progress has been made on the lines described above, and the number of associations, &c., are given in the following table :—

PROGRESS OF MILK RECORDING IN IRELAND.

| Year. | Number of Associations. | Number of Members. | No. of Cows being Tested. |
|-------------|-------------------------|--------------------|---------------------------|
| 1909 | 1 | 2 | 47 |
| 1910 | 1 | 2 | 47 |
| 1911 | 12 | 85 | 928 |
| 1912 | 42 | 330 | 3,562 |
| 1913 | 69 | 485 | 4,804 |
| 1914 | 65 | 484 | 5,550 |
| 1915 | Figures | not yet available. | |

ENGLAND AND WALES.

The scheme of the English Board of Agriculture was issued in February, 1914, and consists of two parts. Part I consists of the Model Rules for a Milk Recording Society which is formed for the purposes of the Board's scheme. These rules are issued as a guide to any society in drafting its own rules, and need not be adopted exactly as stated, but grants will be made to societies only if their rules conform substantially to those issued by the Board. Part II consists of the regulations in accordance with which the Board are prepared to make grants to societies, and the most important of these are given briefly below* :—

A society shall apply for grants to the Live Stock Officer of the Province, who will report thereon to the County Live Stock Committee ; the society must have at least ten ordinary members, and these between them must own at least 100 cows in milk.

A society must appoint a recorder, whose appointment shall be subject to approval by the County Live Stock Committee, and the recorder shall, at least once every six weeks, without notifying the owner, visit each herd under his supervision at milking time both evening and the following morning, see each cow milked and the milk weighed, and enter the weight of milk and such other particulars as are required on the form provided. He shall also, if directed by the society, take samples of the mixed milk at evening and morning visits, and forward such samples to be tested for butter-fat, and, if requested by the owner, take samples of milk from individual cows for butter-fat tests, or forward particulars of the rations of the cows to the Live Stock Officer of the Province, to obtain the latter's advice thereon. Each member must see that the milk of two consecutive milkings, evening and morning, of each cow in his herd is weighed separately, not less frequently than once a week during the whole period of lactation and on the same days each week, and must furnish the committee of the society, by a fixed date, with a signed annual record of such weighings. The committee of the society shall select the days of weighing for each member, and with weekly weighing Saturday evening, Sunday, and Monday morning must not be selected. Each member must allow his cows to be marked (tattooed) in the ear with an identifying mark or number. The society shall fix the date of the commencement of each year's operations, and must supply to the Board copies of the annual yields of every cow belonging to its members. Each society may raise part of its income by annual subscriptions, payable by each

* Full details of the Scheme can be obtained from the Board of Agriculture, 4, Whitehall Place, S.W. ; or from the Provincial Live Stock Officers.

ordinary member, but no grant will be awarded where the annual subscription exceeds £2 per member. The grant awarded by the Board, will, subject to certain provisions, be equivalent to one-half of the expenses reasonably incurred by the society up to a maximum of £50, unless the number of herds exceeds 25, when the society is eligible for a proportionately increased grant. All record forms will be provided by the Board. The remainder of the necessary income of a Society will be raised by levies based on the number of cows of the various members.

As soon as the recorder of a society has completed the first round of visits and marked all the cows, part payment of the grant will be made to the society. The Board of Agriculture will issue certificates of the annual milk yield of any single cow or cows on application by the owner through the secretary of a society.

As the milk record scheme was part of the larger scheme of live stock improvement initiated by the Development Commissioners, the organisation and supervision of milk record societies was in the hands of the live stock officers appointed to the different agricultural provinces in England and Wales, and during 1914 many meetings were held throughout the length and breadth of England to explain and discuss the scheme. As a result, 15 societies commenced operations that year, but the outbreak of the war, and the consequent dislocation of, and difficulty in carrying on, ordinary farm work, has greatly hindered progress since. Nevertheless, in 1915, four societies commenced work and, so far, three have commenced in 1916.

As each society fixes the date on which it starts its year, and as these dates vary, it is not yet possible to get accurate figures for the number of members and cows for each year. But the following figures have been supplied to the writer through the courtesy of the Board of Agriculture, and may be taken as representing the progress which has been made and the present position in this country.

PROGRESS OF MILK RECORDING IN ENGLAND AND WALES.

| Year. | Number of Associations. | Number of Members. | Number of Herds. | Number of Cows. |
|--------------|-------------------------|--------------------|------------------|-----------------|
| 1915... .. | 19 | 349 | 376 | 9,493 |
| 1916 (March) | 22 | 400 | 427 | 11,000 |

The next table shows the progress which has been made in the various provinces into which England and Wales has been divided :—

| Province. | No. of Societies. | No. of Members. | No. of Herds. | No. of Cows. |
|---|-------------------|-----------------|---------------|--------------|
| 1. Armstrong College, Newcastle-on-Tyne | 2 | 56 | 56 | 900 |
| 2. Victoria University, Manchester | 2 | 58 | 58 | 1,923* |
| 3. The University, Leeds | 1 | 11 | 11 | 122* |
| 4. Harper-Adams Agricultural College, Newport, Salop ... | Nil | — | — | — |
| 5. Midland Agricultural and Dairy College, Kingston, Derby... | 4 | 52 | 52 | 1,320 |
| 6. The University, Cambridge... | 4 | 83 | 83 | 2,400 |
| 7. South-Eastern Agricultural College, Wye, Kent | 1 | 23 | 25 | 700 |
| 8. University College, Reading... | 2 | 31 | 37 | 1,390 |
| 9. The University, Bristol | 5 | 73 | 92 | 2,110 |
| 10. Seale-Hayne Agricultural College, Newton Abbot ... | Nil | — | — | — |
| ENGLAND | 21 | 387 | 414 | 10,865 |
| 11. University College of Wales, Aberystwyth | 1 | 13 | 13 | 135* |
| 12. University College of North Wales, Bangor | Nil | — | — | — |
| ENGLAND AND WALES ... | 22 | 400 | 427 | 11,000 |

In several districts where milk recording had been in progress before the advent of the national scheme, the farmers and others have not yet been able to harmonise their previous methods with those of the official scheme; and while the work has had to be given up in at least one county, in two others—Berks and West Sussex—societies independent of the Board's grants are in operation, including, respectively, 1,200 and about 600 cows.

There are several important points in the above three national schemes where there are notable differences in procedure, and a brief discussion of some of these points may be of value in showing how the various difficulties have been met and where improvement is still possible and desirable.

FREQUENCY OF WEIGHING.

It will be universally granted that the chief object of milk recording is to obtain *trustworthy records* of the milk yield of cows, so that farmers may have this information to guide them in weeding out poor milkers, in breeding good milkers, and in the feeding of cows at all times. Undoubtedly, the most trustworthy record is that obtained by daily weighings, but the labour involved is so great that no milk record

* These figures are partly based on estimates.

scheme on this basis could hope for success amongst average dairy farmers. From the information already given, it will be seen that both the English and Irish schemes require weekly weighings to be taken, whereas in the Scotch scheme the records may be taken at intervals of two, three, or four weeks; in fact, the tendency in the Scotch societies has been to increase the interval between the weighings, and in 1914 the shortest interval was 19 days (three societies), and the longest 28 days (four societies), while 18 societies weighed at 21-day intervals. Investigations have shown that the error in weekly weighings is unlikely to be greater than 2 per cent. from the total of daily weighings, but with fortnightly and monthly weighings the possibility of error increases to 4 per cent. and about 8 per cent. respectively.* These facts afford good evidence in favour of weighing at intervals not exceeding one week; but there is another aspect of this question which is very important. All comparisons of daily, weekly, fortnightly, and monthly weighings have been based on figures obtained from some herd where daily records were taken, and under these conditions, where weighing is part of each day's work, the *minimum* divergence from day to day will be found. On the other hand, where weighing is done at intervals of three or four weeks and is, therefore, not part of the daily routine, the circumstances make for the *maximum* divergence on the weighing day from the yield of other days. It is highly probable, therefore, where monthly weighings only are done, that the error is frequently above the 8 per cent. stated, and it is also more probable that the error will be above than below the true yield. It must also be recognised with weighings at wide intervals, that there is much more opportunity for affecting the milk yield on weighing days by slight changes in the feeding in both winter and summer, or by more efficient milking, and this fact, which can be taken advantage of by the unscrupulous, constitutes a serious defect in the Scottish scheme.

It should also be noted in this respect, that where weekly weighings are required, the farmer is responsible for the work, but in Scotland the weighing is done only by the recorder. This may make for greater accuracy as regards the actual weighing of the milk, but it is obvious that weekly weighings could not be done by the recorder without reducing the size of the societies or unduly increasing the cost. On the whole, weekly weighing by the farmer, with a sufficient number of checks by the recorder, will give more trustworthy results than weighing at longer intervals by the recorder only.

METHOD AND FREQUENCY OF TAKING SAMPLES.

Where samples of milk are taken from individual cows for butter-fat tests, the situation changes somewhat. If the results obtained are to be of any value, fair samples must be taken in the most careful manner, and as the possibility of mistakes and carelessness is greater than in the weighing of the milk, there is all the more reason why this work should be left as little as possible in the hands of the cowman.

* See Bulletin XXV. University College, Reading.

The writer's experience has been such as to lead him to place very little reliance on the results from samples which have been taken by anyone who does not clearly understand both the reasons for and the methods of taking a just sample of milk. Accurate samples are most likely to be taken when the work is always done by a trained and reliable recorder or supervisor.

Immediately trustworthy sampling has been arranged for, there arises the question: How frequently must samples be taken during a lactation period to get a result which truly represents the average percentage of butter-fat? No answer based on experiments is generally available, and owing to the amount of work involved, the tendency of recent years has been to increase the intervals between the tests. It is a well-known fact that the percentage of fat in milk varies considerably from day to day, and it is conceivable that by taking samples only once a month (10-11 tests per lactation period), the results will not be fairly representative. As the Irish scheme provides for the taking of samples weekly (by the farmer or cowman) and the testing of these monthly, the Scottish scheme for the taking of samples (by the recorder) at intervals of two, three, or four weeks, and the English scheme for the taking of samples (by the recorder) at any interval up to six weeks, it is obvious that a definite pronouncement on this subject is badly wanted. It is unfortunate that the English scheme, without evidence, should countenance the suggestion that reliable results can be obtained by tests at six-weekly intervals—and results which are not reliable are harmful as guides in selection and breeding.

It is to be hoped that at the first reconsideration of the English scheme, the sections relating to butter-fat tests will be carefully revised and greater encouragement given to societies to take up this work. At present the initiative must be taken by the farmers themselves, and they must bear all the extra cost, as no additional grant is awarded to a society which takes up systematic butter-fat tests. In cheesemaking and buttermaking districts, the value of cows cannot be correctly ascertained by studying records of yield only, and it should be possible to devise some addition to, or modification of, the present scheme, which, with only a moderate addition to the cost, should give butter-fat test results as reliable as the present milk yields.

NOTIFIED OR SURPRISE VISITS BY THE RECORDER.

Associated with some of the points discussed above as affecting the trustworthiness of the records (butter-fat tests as well as milk yields) is the system adopted as regards the visits of the recorder—whether they are “notified” or “surprise” visits. Again, the various schemes are not in agreement. The English scheme insists on surprise visits only by the recorder at intervals of not less than six weeks; the Irish scheme requires, in Class B associations, monthly visits by the supervisor, but the nature of the visits is not specified; in Scotland, only notified visits, or visits in a fixed order, are made. In all schemes visits by the officials of the central authority may be made to any farm to inspect the books, &c., without warning of any kind.

No lengthy argument is required to show the utter foolishness of "faking" records in any way where these records are to be made the basis of selection of cows and bulls for breeding, but where records are also valuable as a means of getting a high price for animals sold to other breeders (either home or foreign) it is a necessity from every point of view that all due precautions be taken to prevent even the opportunity for deceit, and to give the records a reliability which will be recognised both at home and abroad.

In societies where the recorder has to do many butter-fat tests or collect details of the feeding, or in districts where the farms are far from a village, there are strong reasons why the visits should not all be of a surprise nature, but it cannot be doubted that the inclusion, as an essential part of any scheme, of a minimum number of surprise visits adds to the trustworthiness of the records and the value of the scheme as a whole.

RESPONSIBILITY FOR KEEPING OF RECORD BOOKS.

Another point, which at first sight may appear of minor importance, is the responsibility for the keeping of the record books. In Scotland the recorder has to make all the entries in the books, bring the total for each cow up to date at each visit, and forward duplicates of the actual weighings to the central office; in Ireland, the farmer undertakes to enter the weekly weighings on the byre record sheet, but the supervisor each month transfers the weekly records to the monthly statements and makes all the entries of the butter-fat tests, &c.; in England, the farmer is responsible for entering the weekly weighings, both on the weekly record (byre) sheets and in the annual register for each individual cow, and must furnish a signed annual record to his committee, while, at the end of the milk recording year, the recorder checks the additions and calculations necessary to arrive at the annual milk yield of each cow, and countersigns the annual record prepared by the farmer.

From these comparative requirements, it is obvious that, under the English scheme, the farmer has the maximum amount of entering up to do himself, whereas he has the minimum under the Scottish scheme. In one of the county societies in England, working on a local scheme, the farmer is responsible for the weekly weighings, while the recorder enters these weighings in the annual record sheets and brings the total up to date at each monthly visit, but this method did not meet with the approval of the Board of Agriculture, as it was held that the farmer missed much of the educational value of milk recording by not having to do the entering up himself. It would be very interesting to know if the checking of the farmers' additions and calculations by the recorder involves many corrections, as in the writer's experience greater accuracy is obtained and much time saved by having the recorder responsible for all additions and calculations. Also, while farmers with large herds can place all this arithmetical labour in the

hands of a clerk, the working farmer, who has most need of the benefits of milk recording and who is often not an accomplished penman or arithmetician, must do the work himself.

COST TO THE FARMER.

As far as the cost to the farmer is concerned, all the schemes give financial assistance, which, considering the benefits following from milk recording, must be regarded as very satisfactory. The farmer's share of the expenses of one year's work is probably always somewhere between 1s. and 2s. per cow, and even at the higher figure the information received is well worth this expenditure, and where it is acted on with judgment can hardly fail to increase the average annual yield per cow, and after a few years, the market value of both cows and young stock.

The other important differences between the three schemes do not bear directly on the chief object of milk recording, but they nevertheless deal with points which ought to receive the careful attention of dairy farmers. Only two of these will be mentioned here—the formation of registers of good milking cows and the ascertaining of the cost of feeding.

FORMATION OF REGISTERS OF COWS.

At present, only the scheme of the Irish Department of Agriculture deals with this point with the object of forming a register or herd-book of Irish dairy cows independent of pedigree. The minimum milkyield for entry into this register is given on page 11, and, in addition, only animals which the Department considers to be of good conformation and well-defined Shorthorn type will be accepted for entry. A fee of 2s. 6d. is paid for the inspection of each cow. The owner of each registered cow must comply with the following conditions:—

- (a) To have the animal served by a registered dairy bull or by a pure-bred Shorthorn bull, which has been passed by the Department as up to premium standard ;
- (b) To furnish to the Department on the prescribed form within seven days from the date of birth, particulars regarding sex, colour, markings, &c., of each calf produced by a registered cow, and such particulars of the sire and dam as the Department may require ; and
- (c) To keep on the prescribed form a record of the breeding, date of birth, &c., of progeny, for the purposes of future registration. This record must be open to inspection at any time by the Department.

Under certain conditions, the male progeny of registered cows are eligible for inspection for provisional selection for premiums under the Department's cattle breeding scheme, and if so selected, will be entered as "Registered Dairy Bulls."

It is obviously to the advantage of Irish farmers to have as many as possible of their cows entered in the Department's Register, and it

is to be hoped that this subject will soon be fully considered in England.

The compilation of registers of heavy-milking cows has been done to a certain extent in this country for Guernseys and Dairy Shorthorns and for Ayrshires, and on a much greater scale in the United States for the dairy breeds of that country.* In both countries the registers have been formed by the breed associations, and they are usually published as appendices to the yearly herd books, or as independent annual reports. While the herd books supply accurate information on the ancestry or breeding of all animals entered in them, the object of the register is to supply an authentic record of the dairy capacity of individuals, both male and female, the yield and quality of milk in the case of cows, and the number of daughters which have qualified for entry into the register in the case of bulls.

The fact that pedigree is in itself no guarantee of individual merit, especially as regards milk production, makes the information contained in such a register of great value as a supplement, and perhaps as a corrective to pedigree in the breeding of dairy stock, and there is distinct need for the formation of such registers within all the dairy breeds of this country. It can only be by a comparison of the registers of the various breeds that their relative values for dairying purposes will be ascertained.

There is also undoubtedly great scope for such registers of heavy milkers independent of the pedigreed animals entered in the various herd books. The average dairy farmer of England depends on the non-pedigree cow of Shorthorn breeding for his livelihood, and the recent initiation of live stock improvement schemes by the Board of Agriculture is designed to improve the type of animals throughout the length and breadth of the country, while where milk record societies have been formed, it will only be a matter of time before an effort is made to catalogue the heavy milkers.

It may be suggested here that milk record societies should form their *local registers* with conditions of entry which would admit the registration of all cows with good milk records and up to a certain standard in conformation and substance, while a *national register* should be formed by the Board of Agriculture with more severe conditions of entry, both as regards yield and type. Cows eligible for entry into the local register would be good useful animals, but those of sufficient merit and producing power to obtain entry into the national register would soon come to be recognised as being a specially select class, and both they and their progeny would become more valuable. Owing to the great increase in the demand during recent years for pedigree Shorthorn bulls of dairy breeding, these animals are now very often beyond the purchasing power of the tenant farmer; the latter has therefore often to be content with a bull out of a good cow in a herd where a pedigree bull is used, and when registers of first-class cows are published the tenant farmer will be greatly aided in getting animals of recognised dairy capacity.

*In the United States such registers are known as "*Advanced Registers*."

It is not by any means an easy matter to state clearly the conditions which should be fulfilled before cows are eligible for registration, but provision must be made for the following points:—

1. Classes in register according to age of cow.
2. Length of period in milk.
3. Minimum yield of milk.
4. Interval between calvings.
5. Quality of the milk.
6. Type of cow.

An attempt has been made by the Milk Record Society operating in Berkshire to form a register for heavy milkers,* but more open discussion is required before the conditions of entry are decided upon.

FOOD RECORDS AND COST OF FEEDING.

Only the Scottish scheme makes provision for systematic calculations of the cost of feeding, but several local societies which were in existence in England before the official scheme was introduced have gone fully into this subject and issued valuable reports. The English scheme provides for the farmer obtaining advice on the suitability of rations from the live stock officer, and leaves it open for each society to go more fully into this subject as the members desire.

It is no doubt wise at the commencement of the work in England to go slowly, and to concentrate at first on the keeping of accurate records of yield, but societies in districts where milk is sold by contract, and where heavy feeding is customary during the winter, would do well to encourage the keeping of food records and the calculation of the cost of feeding. A high yield may not be an unmixed blessing if the cost of production is excessive. The experience of local societies where food records have been kept has been that it is usually possible to make greater economies (and therefore greater profits) in the use of home-grown foods than in concentrated foods, and the attention of the farmer is finally directed to the unexpectedly close relationship which exists between the economical growing of sufficient supplies of home-grown foods and the profitable production of milk.

There are still other problems associated with milk recording which cannot be considered now for lack of space, but reference may be made to the need for uniformity throughout England in the methods of stating a cow's yield—no authoritative definition of a lactation period has been given—and of the methods of stating the average yield of a herd. Both these points must be settled before it will be possible to compare accurately either the yields of cows or the progress made by the societies in improving the yields throughout the country.

In conclusion, the writer would emphasise the necessity for the selection by societies, of recorders who are well trained and thoroughly reliable, and of the need for care and accuracy in the *first details* of the work. If the *weighing* and *sampling* of the milk is in any way inaccurate or unfair, the whole of the subsequent calculations, and the deductions drawn from the results, by farmers, breeders, recorders, or statisticians, are rendered unreliable and misleading.

* See Bulletin XXV. University College, Reading.

THE MILKING TRIALS AND AFTERWARDS.

By W. ASHCROFT.

It is about 37 years since the British Dairy Farmers' Association began to give at their annual show, side by side with prizes given by inspection, prizes also for milk yields, taking into consideration not only the quantity but the quality of the milk given.

The milking trials begun in 1879 have with some modification and improvements in the carrying out been continued ever since; other societies have followed suit, witness for instance the milking competitions at Tring, the Royal, and the Bath and West Shows; but the Association may fairly claim to have given the lead in this direction, as well as maintaining the premier position in the completeness with which their results are arrived at.

These competitions have elicited much interest, and have done a great deal of good in calling attention to what should be the main point in estimating the worth of a cow, but they are by no means the sure and safe criterion that some consider them, and the results obtained must be taken with considerable reserve until some means are found of ascertaining what the same cows are doing *at a later period and in more normal conditions*.

The writer has been connected as one of the judges for many years with the milking trials, and in no carping or hypercritical spirit has often urged that some such procedure should be adopted. As long ago as the report of the milking trials for 1907, he pointed out that the first prize that year in the non-pedigree Shorthorn class, who had also carried off the Barham and Spencer Challenge Cups, gave 6 gallons of milk with the extraordinary percentage of 5·84 fat in the morning and 6·90 in the evening, had made 4 lbs. of butter from the day's milking, and ought to be written down "a marvel." He then went on to say "it would be a step in the right direction if the British Dairy Farmers' Association, who attach great importance to their milking trials, could see their way to making them of more value by arranging to have cows with such records as the above or approximating thereto tested again—say, when they have been six months calved. It would not be a very expensive matter to have the morning's and evening's milk of cows like the above taken even twice, say, when they have calved four months and eight months, and the public would then be in a far better position to assess the quantity given at the Dairy Show at its proper value. Surely any breeder or exhibitor would be pleased to have such tests made."

The judge of the butter tests the same year, alluding to the above cow, who made 4 lbs. of butter from one day's milking, wrote in the same way as follows:—

"It would be very interesting to know whether this phenomenal yield is consistent during the whole lactation period or not. The question of following up such cows as No. 37 and the advisability of

taking a series of three or four tests during the lactation period is worthy of consideration. Such tests would not only prove of interest, but would also help to throw some light on the possibility of cows yielding an abnormal amount of butter fat for a comparatively short time. It would also prove of great interest if information could be obtained as to the treatment and feeding of this particular cow previous to and after calving, as to the length of time she was allowed to run dry before calving, etc., etc."

Take another instance in 1913, when the winner of the Spencer Cup, calved only 24 days, gave $5\frac{1}{2}$ gallons of milk with an extraordinary percentage of fat, viz., 5.51 in the morning and 5.69 in the evening.

Or again, the writer well remembers the case of a cow winning a valuable milking prize, whose milk showed a very high percentage of fat, and yielded a corresponding weight of butter, but the latter was of such an oily texture that it could not keep shape on the board, and was more like an ill-conditioned jelly.

To quote again the judge of the butter tests another year:—"Several cows yielded oily textured butter," and then follows the cryptic and somewhat cynical sentence, "exhibitors must experience great difficulty in forcing their cattle for milk production, and at the same time keeping up the colour and quality of the butter yielded."

It must also be noted that abnormal feeding regardless of expense can affect the milk yields in a minor degree as well as in pronounced cases which excite attention.

There is but one satisfactory criterion of a cow's milk yield, and that is a complete record of what she gives during the whole lactation period, and a three years' record would naturally be still more valuable testimony.

This, of course, cannot be obtained at the Dairy Show; but as it is a fact well known that most of the valuable prizes are generally taken by cows calved only 40 or 50 days, and that there is no check on either the time they have been lying idle, or how far skilful and forcing feeding has been applied both before she came to and while she was at the Show, surely it is time the Association should try and take some steps on the lines suggested above to corroborate or otherwise the results obtained in the milking trials.

Milk record societies and persons interested therein are growing all over the country; the expense of taking the tests ought not therefore to be great, and the writer would suggest that exhibitors should be given to understand that any cow taking a milking prize shall, if the Association so desire, be tested, say, four months and eight months after she has calved. Then any cow taking a big prize who in these tests approximated in her yield to the weight and quality of the milk given at the Show (of course taking into consideration the lactation time) would rise in general estimation, and one who showed a marked falling away would have the reputation to which she was entitled.

These tests, side by side with the yield given at the Show, could be published as occasion arose in the Journal.

GRADING UP OF DAIRY CATTLE.

By J. L. SHIRLEY, Bletchley.

THERE is nothing in the agricultural world with greater prospects for the future than the dairy farming industry in this country. The writer anticipates that the consumption of milk per head of the population will be much greater in the future than in the past, owing to the more general recognition, not only of the unequalled value of milk as a food, but of its comparative cheapness when contrasted with all other foods.

New milk has distinctive properties which are modified somewhat by most of the methods of preservation, and as no imported milk or form of milk can take the place of the new home-produced article, the increased demand of the future must be met by the dairy farmers of this country.

Another factor in the situation is the absolute depletion of Dairy Cattle in Northern France and Belgium, which after the war will have to be replaced, and principally from this country.

To be able to take full advantage of their opportunities, dairy farmers should see that their house is put in order by the grading up of their dairy herds on the right lines so as to get maximum results, and to do this much greater care must be given to this subject than has been devoted to it in the past.

When one considers that the average yearly milk yield of cows throughout the country is round about 400 gallons per cow, no further evidence is required to demonstrate the past lax methods of a large number of dairy farmers; while the fact that some herds have yearly averages of 700 and 800 gallons, shows what can be done when correct methods are adopted.

In my opinion, the reason of the above low average is indiscriminate breeding and buying of cattle to put in the herd. The main fault generally is in the selection of the bull. But mistakes are also made (though not to such a large extent) in the purchase of the females. Everyone knows that, in the dairy herds throughout the country, in a great many cases owners do not know definitely if the bull used is descended from good milking parents, if they are of good constitution, and, last but not least, if the dam had a good-shaped udder with good teats well placed. I will here give an instructive instance. In discussing this subject, one who had been a large dairy farmer gave me the following experiences. He stated that he purchased a bull descended from a good cow which was a good milker, but with the drawback that she had windy teats. By this bull he had a nice lot of heifers which he bred for his dairy herd, and in nearly every instance they calved down with windy teats. He experienced great loss when he wished to dispose of these as cows, as a cow with windy teats, compared with one which has a good-shaped udder and teats, has a

lower market value to the extent of fully £5, and in many cases more. Another bull which he bought afterwards was bought chiefly on its good appearance. By this bull the heifers were an exceptionally good lot to catch the eye, but on calving they made no udders, which was, again, a most serious loss. The greatest disappointment, he said, was the tremendous loss of time incurred before he knew whether he was on the right or wrong lines. These two instances of waiting for the heifers to develop and calve down to come into the herd took up the greater part of six years. Now, in these cases, had the bulls been descended from dams of good conformation, good milkers, and with good constitutions, and the sires bred on similar lines, it would insure the almost guaranteed results of getting the right sort of heifers by such mating.

Everyone who was at the late Lord Rothschild's sale noted the excellent heifers and their beautifully-shaped udders, which were only obtained on the lines I have above mentioned.

I do not, of course, advocate dairy farmers buying stock bulls at extremely fancy prices on account of their long pedigrees, as there are many short-pedigreed bulls which would answer the farmers' purpose as well (where the herd was not a pedigreed one), but an outlay of an extra £20 or £30 in obtaining a bull bred on the lines I have referred to would increase the value of the herd by hundreds of pounds, and the milk cheques in the course of years would also be materially increased.

Regarding the improvement of herds on the female side, in addition to the home-bred heifers, many heifers are brought in by other means. It is a common practice in some districts to buy a bunch of heifers at a market (and put a bull with them, often one with nothing to recommend him, so long as he will get them in calf), and it is very seldom the buyer knows anything about their parentage; in fact, they are often made up from different lots bred on various lines, got by beef bulls and, generally, nondescript bulls. Consequently, these heifers, when they calve down, are drafted into the dairy. It often happens that in such a lot an exceptional heifer asserts herself by calving down with a first-class udder, and the owner takes this as his cue, always having his eye on this exceptional heifer and forgetting the indifferent ones—or, I may say, the failures, as that is the right name for them—and will go on buying and breeding again on the same lines. By this means a lot of cows are spread about the country which never are, and never will be, dairy cows in the true sense of the word.

Another thing to guard against is selecting a bull out of a cow with a high milk record and which has only her milk record to recommend her. It would be folly to use bulls from some thousand-gallon cows as stock bulls, where the dams are so lacking in constitution, and this defect, generally speaking, is inherited by the male progeny.

The chief thing is to see that the dam gives a good milk yield; if 1,000 gallons, so much the better, provided that besides the milk yield she has a good constitution, and is a good cow in herself, able to eat and digest food in proportion to her heavy milk-yielding propensities and to keep in sound health.

In concluding this short article I should like to impress on dairy farmers the great importance, where heifers are being bred for the dairy, of keeping them in natural store condition until they are well in calf, when they can be done much better. If a young heifer is done too well in her first two years, she will hardly ever come down a good milker, the explanatory theory being that the milk cells get filled up with fat.

Finally, I think readers who are practical dairy farmers will agree with me that in the grading up of the dairy stock of this country on the lines I have mentioned are the foundation stones on which successful and profitable dairy herds can be built up, and nothing will repay the dairy farmer better than giving special attention to the improvement of his dairy stock, by breeding and selecting only the very best type of animals.

AN INQUIRY INTO THE CONSTITUTION AND USE OF MILK SUBSTITUTES FOR CALVES.

By GERVAISE TURNBULL, F.L.S., late Agricultural Instructor, Wilts County Council.

THE high prices which young stock have recently commanded lends point to the increased attention which has been given to the feeding of calves. It is obvious that where it is more profitable to sell milk than feed it to the calf, attention should be directed towards making artificial substitutes as good an equivalent as possible, or as the proportion of milk fed with it demands, as will be subsequently shown.

Though the feeder cannot replace fully the life-giving properties of milk in spite of bringing the composition of the substitute very close to it so far as analysis goes, it is quite possible to get suitable substitutes with a few simple foodstuffs. Rightly blended, calves do well on them, and they have the advantage of being far cheaper and sometimes purer than proprietary mixtures. The following examples of mixtures of this kind have been gathered from various sources, and have been found useful as partial or total substitutes for new milk, and some of them will be found to have the same nutritive ratio. As there is some ignorance prevailing as to the composition of milk, it seems likely that with some knowledge of its relative composition and that of its substitutes, there will be less chance of the latter being made out of conformity with milk, a contingency more likely to arise if bulk and not weight, as is too often the case, is the measure of the foundation material.

Since the calculations to get such comparative values are rather elaborate, a summary has been worked out by the writer of the amount of digestible food constituents contained in a given quantity of these mixtures—Group “A”—together with the percentage composition of (1), (2), (3), and (12), the recipes for which have previously appeared in the *Journal* of the Board of Agriculture, so that they may be compared with similar nutrients in milk.

A strong practical point in favour of such mixtures, besides their economy, is the fact that experiment has demonstrated that when calves are fed in this way the good effects are lasting, and young stock maintain a thriving condition till fattened off, though they may not show the weight or quite the quality and good appearance associated with new milk. Weight apart, there is, indeed, little difference, and sometimes even a subsequent superiority has been shown by gruel-fed calves. The Woburn results are further testimony in this direction, and the Scotch experiments (Bull. 17, N. of Scotland College of Agriculture).

28 *An Inquiry into the Constitution and Use of Milk Substitutes for Calves.*

MIXTURES—GROUP "A." EQUIVALENT TO PER CENT.

| | | | | Diges- tible. Per cent., 66-67 | True Albu- minoid Ratio. |
|-----------------------|----|----------------|--|--|-----------------------------------|
| Digestible. | | | | | |
| (1) Linseed cake meal | 14 | pts. by weight | } Albuminoids (true) Fat ... Carbohydrates ... | 19 | } 1 to 3½ |
| Crushed linseed ... | 5 | " " | | 12 | |
| Wheat flour ... | 5 | " " | | 36 | |
| Locust bean meal | 2 | " " | | | |
| (2) Linseed cake meal | 2 | pts. by weight | } Albuminoids (true) Oil ... Carbohydrates ... | 17½ | } 1 to 4 |
| Oatmeal ... | 2 | " " | | 13½ | |
| Crushed linseed | 1 | " " | | 36 | |
| (3) Oatmeal ... | 8 | pts. by weight | } Albuminoids (true) Oil ... Carbohydrates ... | 11 | } 1 to 6 |
| Crushed linseed ... | 1 | " " | | 10 | |
| | | | | 45 | |

CORRESPONDING DAILY RATIONS.

| | No. 1. 3 lbs. | No. 2. 3 lbs. | No. 3. 2½ lbs. | No. 3A. Ditto, plus 5 pints Separated Milk. |
|-----------------------------|------------------|------------------|-------------------|---|
| Digestible Albs. (true) ... | lbs. ·57 | lbs. ·52 | lbs. ·25 | lbs. ·47 |
| " Oil ... | ·36 | ·41 | ·225 | ·23 |
| " Carbos. ... | 1·08 | 1·08 | 1·01 | 1·32 |
| | | | | } 1 to 4 |
| Proportion of Oil ... | 2·01 | 2·01 | 1·48 | 2·02 |
| | ½ Oil. | ½ Oil. | ⅔ Oil. | ⅔ Oil. |

Compare these with :—

| | (4) 3 lbs. Linseed Cake. | (5) 5 quarts New Milk. |
|-----------------------------------|-----------------------------|---------------------------|
| Digestible Albuminoids (true) ... | lbs. ·75 | lbs. ·40 |
| " Oil ... | ·285 | ·47 |
| " Carbohydrates ... | ·96 | ·59 |
| | } True A.R. 1 to 2½ | } True A.R. 1 to 4½ |
| | | |
| | 1·99 | 1·46 |
| | ½ Oil. | ⅔ Oil. |

| | | |
|--|--|-----------|
| (6) Kellner's standard for 2 to 3 months' calf, (average of milk and beef breeds) . | <div> <div> Digest. Albs. " (true) " Oil " Carbos. </div> <div> ·6 ·32 2·0 </div> </div> | } 1 to 4½ |
| | <div> ½ Oil. </div> <div> 2·92 </div> | |

STANDARD CALF MEAL OF THE IRISH BOARD OF AGRICULTURE.

| | 7½ oz. No. 12. | 6 quarts Separated Milk. | Both combined. | True Albu- minoid Ratio. |
|-----------------------------------|----------------------------|--------------------------------|----------------------------|-----------------------------------|
| Digestible Albuminoids (true) ... | ·047 | ·52 | ·57 | } 1 to 2 |
| „ Oil | ·054 | ·015 | ·07 | |
| „ Carbohydrates | ·23 | ·75 | ·98 | |
| | ·331 $\frac{1}{8}$ Oil. | 1·285 | 1·62 $\frac{1}{2}$ Oil. | |

Digestible per cent.

| | Mixture No. 12. | 6 quarts Separated Milk. |
|---------------------------|--------------------|--------------------------------|
| Albuminoids (true) | 10½ | 3½ |
| Oil | 11½ | 5 ¹ / ₅ |
| Carbohydrates | 50 | 5 |

(1) and (2) to be used with water, and 2 oz. of sugar are to be added to (2) and (3), which adds about 4 per cent. to the carbohydrates, but oil and albuminoids are the nutrients which matter most, and it is significant to notice here the great difference between linseed and linseed cake. Some farmers prefer the latter, but a glance at Nos. (2), (1), (4) shows how materially the percentage of fat is altered—from one-seventh to one-fifth—when linseed forms even one-fifth of the mixture. In No. 4 there is actually a good deal less oil than in No. 5, heavy ration though it is, though, as will be seen later, calves thrive on very varying proportions of fat. The albuminoids are similarly decreased unless linseed cake or milk forms part of the mixture. Even oatmeal, excellent as it is for calves, does not make up the deficiency alone unless supplied in excess, and the value of milk when cereal grains are predominant (cf. Nos. 3 and 3A) is clear. If some of this is new milk, the percentage of oil can be raised in the simplest manner without, it should be noted, altering that of the albuminoids, although the proportions of albuminoids to carbohydrates, &c., are not the same in the two kinds of milk, a point liable to be overlooked.

The nutritive ratio of No. 4, it will be seen, is much less than new milk, and this seems to show that however suitable it may be in a mixture, linseed cake is too nitrogenous to supply the whole of the substitute; and yet it is, in practice—along maybe with cake—used as a gruel with skim milk, which is even more nitrogenous in ratio. (See also 10.) This point is emphasised later. Linseed has a ratio of 1 to 5½, which indicates it as a safer food as regards protein, although its excess of oil—great as is the calf's capacity for it—mitigates

against its use in quantity. It is noticeable that the same milk ration is often used for calves of varying ages and with good effect, but, within limits, increasing age does not materially affect the amount of oil and albuminoids required, especially when milk is supplemented with hay or other dry food, because the proportion of these substances to the total food required decreases as the calf gets older.

At normal prices there is not a great difference between the cost of 2, 3, and 3A (milk at 1d. per gallon), but (2) should now be materially the cheaper (as linseed is still moderate in price), though something like 1½d. per lb.

It is somewhat striking that calves do so well on milk substitutes, although the albuminoid ratio differs from that of reu milk, and that this point need not be rigidly insisted upon both experiment and practical experience alike demonstrate.

The following (except No. 9) illustrate this, all being used as gruel, though the addition of milk may, of course, modify the ratios greatly. Indeed, except with new milk and a *mixture* with A.R. 1 to 4, it seems impossible to avoid doing so.

| GROUP B. } | | | | | | Approximate True Albuminoid Ratio. |
|------------|----------------|-----|-----|------------------|-----|--|
| No. 6. | Oats | ... | ... | 4 pts. by weight | ... | 1 to 6 |
| | Linseed | ... | ... | 2 " | " " | |
| No. 7. | Linseed cake | ... | ... | 4 " | " " | 1 to 2½ |
| No. 8. | Oatmeal | ... | ... | 4 pts. by weight | ... | 1 to 6 |
| | Linseed | ... | ... | 2 " | " " | |
| No. 9. | Peas | ... | ... | 1 " | " " | 1 to 4 |
| | Linseed | ... | ... | 1 " | " " | |
| No. 10. | Pea meal | ... | ... | 1 " | " " | 1 to 2½ |
| | Linseed cake | ... | ... | 3 " | " " | |
| No. 11. | Husked wheat | ... | ... | 3 " | " " | 1 to 6 |
| | Linseed | ... | ... | 2 " | " " | |
| No. 12. | Oatmeal | ... | ... | 2 " | " " | 1 to 7½ |
| | Maize | ... | ... | 2 " | " " | |
| | Ground linseed | ... | ... | 1 " | " " | |

Nos. 6 and 8 are recommended from Scotch experience, boiled or made with boiling water. The oat fibre in No. 6 has been found valuable rather than otherwise in preventing constipation, also in America. The oatmeal (non-dried) is otherwise practically the same thing as oats, and it is significant that the difference between the two rations is only about 1 per cent. more albuminoids, 2 per cent. of oil, and 3 per cent. of carbohydrates in favour of No. 8.

No. 9 is recommended as an excellent food by Professor Wallace, who also advocates No. 10, the gruel being boiled and used with skim milk in each. No. 11 has also been found useful in practice, the proportions named being considered the fairest.

No. 12 has been exhaustively tried in Ireland over a series of years, to be used with six quarts of separated milk, and mixed with boiling water. It has proved superior to separated and whole milk mixed, and about equal to separated milk and cod liver oil, in live

weight increase, but financially superior to either to the extent of several shillings per head, and to the extent of £2 over new milk for a feeding period of 20 weeks in each case.

Wheatmeal is another excellent calf food and is used in various mixtures, and the published experiments of exhaustive trials in Ireland show up to the present practically identical results when wheatmeal takes the place of oatmeal.

The discrepancy in practice between albuminoid ratios is seen, too, when calves are fed on large quantities of dry linseed cake or beans (A.R. 1 to 2½) along with bucket food, both of which are successfully used. It is true that gruel, with the best feeders, is generally very gradually introduced, but the change, even then, in time may materially alter the proportion of nutrients contained in new milk. The calf, however, is not at all incommoded if the change is properly made. Take for example the plan (successfully adopted in North Bucks) of substituting a pint of gruel per week for one of new milk, the gruel being made of one quart of linseed-cake dust to a gallon of water. This means that the substituted material is about three-quarters as strong in digestible protein and only one-quarter as strong in oil as the original milk, equal, *i.e.*, to 1 per cent. of fat. Now, per gallon, this only means in addition 1 lb. or so of dust when all the milk has been replaced with gruel, but dry cake is freely fed at a very early age.

The same thing is seen in an exaggerated form when skim, and especially separated milk is used instead of new milk, in much larger quantity, without the addition of oil or meal, as separated milk has a nutritive ratio of 1 to 1½. Its value when "fortified" is demonstrated by the financial returns got from No. 12, and the proper balance of the ration can be adjusted by means of hay. The addition of cake, too, often fed along with liquid food, as in No. 12 (6 to 8 oz.) again alters the ratio, which is necessarily not invariable.

Total crude solids in No. 12 amount to about 2 lbs., cake included, showing that the addition of milk involves the use of a smaller amount of substitute, and a less nitrogenous one we find in No. 3 when milk is largely used—as compared with water gruel. From 1 to 2 lbs. of substitute per calf are variously recommended where skim milk is used, one-third and upwards being gruel, or nearly all milk in the case of Nos. 9, 10, 12.

One thing is certainly clear from recent experiments: there is no necessity where separated or skim milk is freely used to employ a highly nitrogenous food as a substitute, and with corn at normal prices, the free use of cake, even as an accompaniment, seems to be uneconomical, as a rule, convenient and beneficial though it is.

The good returns from No. 12 go to show this, and it was forcibly pointed out years ago by Curtiss of the Iowa Station (Bull. 35), who strongly advocated corn meal.

He says: "It is not only unnecessary but poor economy and poor practice in feeding to use a highly nitrogenous product like oil meal in combination with separated milk; the practice has neither logical reason nor scientific theory for its support." The table

of results got at Iowa partly justifies his strictures (and points to the value of No. 3A), anticipating as it does at the same time the more modern notion of substituting starch for oil.

It shows, too, how a high albuminoid ratio may be maintained though hay is pretty freely used. There seems to be some ignorance prevailing of the high nutritive value of separated milk, accounting, perhaps, for an excessive "fortifying." The very high price of cake now prevailing brings this matter home.

Skim milk has a ratio of 1 to 2, but such is the value of the small amount (7 per cent.) of fat, that good results have been obtained by mixing new milk and separated in the proportion of skim milk.

Calves, then, will flourish on very strong food if properly made as well as on weaker, and more depends on the preparation and quantity fed than on the precise composition. The nutritive ratio of the liquid food is modified again by the nature of the supplementary solid food given, so that a slavish copy of the composition of milk is by no means indispensable. Strong grass, however, is bad for calves, though they do well on lucerne. Beans deserve more attention than they often get, and some farmers are afraid to use them. The writer has seen them fed *ad lib.* to calves a few weeks old, along with new milk, with very good results, though the same diet for young bulls is only found feasible to a small extent. Complaints, however, have reached the writer from one quarter that calves summer less well than when fed on cake. Beans are often better value than cake.

With oil we find a still wider departure from the standard set by milk than is the case with albuminoids (cf. 3A and 5), and here, again, calves thrive. It is notable, for instance, when oil is added to separated milk that the percentage is far less than occurs naturally; yet good results are obtained, and even by the substitution for oil of a considerable percentage of starch, as we have seen. It is here that economy comes in, for starch is much cheaper than even the commoner vegetable oils, and saccharified starch has been recommended as a way out of the difficulties of digestion, which are considerable.

Even Liebig's famous recipe is considerably under par in respect of oil, as it is of albuminoids, and Kellner only recommends 2 per cent. of oil to be added to separated milk, or 5 per cent. of linseed. About $\frac{1}{2}$ or under 1 per cent. is, perhaps, more usual; while very fair results have been obtained in Ireland with about 1 per cent. of cod liver oil (2 oz. to $1\frac{1}{2}$ gallons). It is certainly desirable, however, to use a fair amount of oil in some form, if it is not absolutely necessary, where new milk is not available, and the stunted appearance of calves fed on separated milk without cake is evidence of this. It may not be generally known that the proportion of oil to other nutrients is very much greater for calves, especially young calves, than for older stock, and exceeds that required by pigs and sheep of the same age. This is especially the case with fattening breeds, and is shown by the feeding standard quoted (Group "A"—page 28) and similarly by the Wolff-Lehman tables and those adopted at Cockle Park.

Even 3 lbs. of linseed cake (No. 4), which the writer has seen successfully fed to calves up to about four months old, without bucket food, supplies considerably less fat than a gallon of new milk, the efficacy of which depends to no small extent on its fat.

This suggests the importance of again bearing in mind the relative difference of linseed and linseed cake. A caution should be given against the old practice of using the former unground. As with cottonseed in this form, great harm may be done to the calf's stomach by the steel-like coatings of the seed, but the slight bowel irritation sometimes occurring when the meal is used is negligible. The gruel mentioned on page 30 (Bucks) requires 2 to 3 oz. of linseed cake per pint, whereas $1\frac{1}{2}$ and 2 to 3 oz. per pint of gruel have been successfully used of linseed added in small quantities to skim milk, and even the smaller amount would give more oil than the cake. Compare (Norfolk) about $1\frac{1}{4}$ lbs. linseed per gallon, say $2\frac{1}{2}$ oz. per pint, added freely to skim milk up to all gruel if required. This would represent up to 4 per cent. linseed oil added! As regards bulk care is necessary in feeding water-made gruels at any rate, and $1\frac{1}{2}$ gallons is perhaps the limit advisable daily, though some good feeders do not exceed a gallon, or less. A calf may suck all it likes with impunity, but excess of bucket feeding tends to a pot-bellied condition. It does not seem necessary, however, to withhold water when on bucket food, as with free access to both good calves may be turned out. In comparing amounts of nutrients in gruel materials and milk respectively, it is well to reckon both substances in pounds, and to bear in mind the percentage composition of the former in the liquid form, or percentage discrepancies may be overlooked when the gruel is made up in bulk from its concentrated constituents. About 1 to 3 pints per week of added gruel seems to be the limit in practice, the former being probably unnecessarily small.

In conclusion, the following example of a useful and economical home-made calf meal may be quoted. It has the advantage of being 15s. a quarter cheaper than patent meals and equally good, and has been successfully used in a pedigree beef shorthorn herd of repute known to the writer. It is easily compounded, the linseed being crushed satisfactorily on the corn :—

| | | | | | | | |
|--------------|-----|-----|-----|-----|-----|----------------|-------------------|
| Peas | ... | ... | ... | ... | ... | 1 | part (by weight). |
| Linseed (or) | ... | ... | ... | ... | ... | 1 | " " |
| Linseed cake | ... | ... | ... | ... | ... | 2 | " " |
| Oats | ... | ... | ... | ... | ... | 4 | " " |
| Locust beans | ... | ... | ... | ... | ... | $1\frac{1}{2}$ | " " |

THE DAIRYING OF THE FUTURE.

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DAIRY farming is in a transition stage. It was so before the war began, but the continuance of "war-time" has much accentuated this state of matters, and it is a safe prophecy to make that things on the dairy farm will never be the same as before. Changes are being very rapidly initiated now under present circumstances, and the movement will be continued when peace comes once more.

It is rather strange to think that the handling of cows has been carried on by the human race for unnumbered centuries, but that it is only within the last generation, or a generation and a half, that the whole development of the art and science of cow-keeping has been followed. It is even more strange to realise that the movements which carry within them the possibilities of great results have all been reduced to practical working form within the last ten years or so. Some individual men have been in advance of that time of course: the friends of Dr. Babcock are just celebrating the twenty-fifth anniversary of his invention of the Babcock Fat Tester, which has revolutionised the testing of milk for instance, but the great mass of dairy farmers have only waked up to the things that matter within the last few years. I refer to such things as milk recording, breeding from the best cows only, selecting bulls with a milking pedigree, rationing, and many others, and as these are only at the beginning as it were, it is with a view to discussing the future development of these that this paper has been written. At the moment of writing, I do not know which of the three branches of dairy farming—buttermaking, cheesemaking, or milk selling—is the most important to the community, or as regards the number of cows respectively concerned, but as the new milk trade has developed most of recent years, and has had the most attention from our law-makers and sanitarians, it will be the branch I have most in view, with the proviso, however, that what applies to one will apply, more or less, directly to all. I propose, therefore, in the following notes to take up the various matters that concern dairy farmers and discuss their future outcome as it appears to me.

SANITATION.

In the olden days we had no sanitation about the cowshed. Usage was second nature, and the people who handled the cows and the milk were never troubled by the "muck" they worked amongst. Once, when I was a lad, I heard a Glasgow milk buyer tell my father that one of the farmers who supplied him sent him up milk with everything

in it excepting an old cow. We have progressed a long way since then, and now even the most careless farmer uses strainers, scydes, or even filter-cloths, while the general conditions of producing milk are vastly improved. It is just possible we have gone too far in some respects, and my own belief is that there will be a slackening of many of the restrictions which have been enforced, partly because some of them were quite uncalled for, and partly for financial reasons. The financial side of the question I shall take up later on, but among the unnecessary fads of medical men that will require to be overhauled is that of excessive air space, daily washing down, and sloshing out of the stalls, grooming of cows twice a day, and a large number of little pettifogging details that do not help in the clean production of milk, but entail the waste of a large amount of expensive labour. One dairy farmer, for instance, that I know, and who is producing the best class of milk under his own superintendence, told me that the inspector in his locality was such a faddist that it just required the labour of an extra cowman to comply with his demands as to washing down, grooming, whitewashing, and so on; and that without making the milk any better than it was in the ordinary way. I opine there will be a good deal less of this in future, no matter what laws or orders are passed.

Regarding tuberculosis, we also seem to be in a transition stage of what we believe or can prove about it. It is held that the bovine is not the same as the human form; that it is the same as the human form; that if a human being has contracted the bovine form then he does not take the other kind, and so on. It is pretty evident on the face of it that the pulmonary form cannot be contracted from drinking milk; that babies who are not fed on cow's milk, and yet die of phthisis, cannot have contracted it from milk they did not drink, and that the babies of the well-to-do, who use milk largely, do not die in undue numbers from this trouble.

If cows are tested with tuberculin, they react to the extent of 30, 40 or 50 per cent.; if these are removed it does not clear the herd, for some more will go wrong within the next few months again. Apart from reaction or not the tuberculosis germ can always be found in milk; if a cow is milked dry and then the last thimbleful squeezed out, the germs will be found in it. The Tuberculosis Order has been suspended for the period of the war, and also the Milkshops and Dairies Act, and we do not seem to be any the worse for that, and I would not be the least surprised if they were permanently suspended or at least greatly modified after the war for another reason which will appear immediately.

The principles of dairy and cowshed inspection require to be very greatly improved, and the best method known to me is the score-card system, which was inaugurated in America by Dr. Woodward, of Columbia. This is simply judging by points. A perfect herd and dairy equipment is taken as 100 and certain percentages are allotted to all the things which matter: health of stock, testing with tuberculin, air space, lighting, ventilation, grooming, drainage, water supply, &c., &c. The scheme has been known to me for a long time, but is

now being taken up by one of our sanitary associations—The National Clean Milk Society.

Mr. Macintosh, of Reading College, thinks that most of our dairy farms would earn 50 marks out of the 100. I doubt if they would, but this system of sanitary inspection would speedily lead to improvement. If a farmer were shown that an extra window or better drainage or more whitewashing would earn a higher percentage, he would see to these things; while the laggards would be made to toe the line if threatened with compulsion if they did not obtain "pass marks." It is a system now largely adopted in the States and works without friction, and I think it would do equally well here. Anyhow, sanitary inspection of cowsheds in this country has not been conducted in a way to impress farmers as to the knowledge or commonsense of the inspectors in many cases, and anything that would carry farmers with it is to be welcomed.

LABOUR.

In every department of farming it is the labour that is the most important question. Science and cleverness are of little value if the actual carrying out of the work of the farm is difficult. This has always been so in the past under ordinary circumstances in respect of dairy farms. On a general agricultural or stock farm, a temporary deficiency in this line did not matter very much. If a pair of horses stood idle for a day or two no great harm was done. If we did not get drilling corn to-day it could be done to-morrow; if the cattle feeder was absent, some other one could serve for a time; and so on. Unfortunately, however, in dairying it is not possible to let things stand over in this way; the cows must be milked night and morning, and on Saturday afternoons and Sundays as well as on week-days, and 15 cows are the ordinary limit as to number for each person at a time. This has meant that cowmen could not take a day off when they wanted one, and there were no week-end holidays, and therefore it also meant that the ordinary farm workman would not take to dairying if he could get a chance at any other kind of labour, and thus it was only in the days when corn farming was at a discount that cowmen were plentiful.

The advent of the war has altered all that very materially, and the labour difficulty has been greatly accentuated. As this paper is a discussion of the future of dairying and not of the present or the past, it will throw some light on the question to discuss what can possibly be done in the matter of milking. Some time ago I read in an American paper of the style of milking adopted on a model farm in New York State, in which every milker milked 35 cows night and morning. These men did nothing else, of course, as other cattlemen fed and cleaned out, and the practice was for the milking to begin at 3 o'clock in the morning and finish at 7 a.m., and then again from 3 to 7 in the afternoon. This is at the rate of nine cows per hour. It took the milkers about a week at first to get up to this number, as about 24 cows is as much as a man can do at one sitting before his wrists and fingers give out, but after that they gradually increased as their muscles hardened

to the job. I have heard of one man doing 40 cows for several days when suddenly deserted by his helpers ; he milked 24 before breakfast, and the rest after, and began again after dinner, but these are cases of feats which cannot be attained to in ordinary continuous every-day work.

The usual allowance, however, is from 12 to 15 cows per man (or woman), and it takes a man's whole time during the rest of the day to feed and clean this number. Unless, therefore, there are some very great changes in the methods of working and in the pecuniary results to both masters and servants, the handling of cows will become impossible.

Much is being made of the possible use of women milkers just now. As a help through a critical time the movement is to be commended, and good women milkers will always beat men at the job, but afterwards I do not think they will continue at the same. I was brought up in the north where all the milking was done by women, and so much was it reckoned women's work that I never learnt milking myself, and in a parish of over 3,000 inhabitants wholly given over to dairy farming I do not think six male milkers could have been found. All the same there is one great and outstanding objection to women milking as a regular state of matters, and it may be summed up in one word—tantrums. Any man who has ever bossed—or tried to boss—a gang of women milkers need fear nothing else on earth, for he will be able to go anywhere and do anything ever after. Men have been in the course of ages gradually superseding women at this job, and Scotland is one of the very few civilized countries where it still obtains as a department of female labour, but it is significant that the first five milking machines brought out in this country were invented in Scotland ; this to my mind is a sufficient commentary on the matter of female milkers. While the war is on, however, any and every kind of help is to be welcomed, but matters will be different afterwards.

THE MILKING MACHINE.

The future of dairying will be largely bound up with the failure or success of the milking machine ; if it succeeds then the future of dairy farming is hopeful ; if it fails then the future is black indeed from a labour point of view. A successful machine means that a few—very few—capable workers can milk a very large number of cows. Any ordinary stockman can feed and tend cows well enough with a little supervision, but the milker is an expert, and if we can get a machine to do the expert work then there is a happy future coming.

At the same time it is just as well to understand clearly that a machine does not really save any labour, and will not in the future ever be able to save any. This may be rather surprising information to some, but it is nevertheless true. The facts of the case are that the number of men (or women) required to bring in the food, prepare it, serve it to the animals, clean out the dung and litter at least twice daily, groom the animals as often as possible, and so on, must be allowed

at the rate of one person to every 12 to 15 cows. This means that they might milk those cows as well. The only advantage a machine brings is that if one or two or three people can milk a herd with it, then the rest of the work can be done by anybody else. This means that carting in fodder, roots, litter, and feeding stuffs to the sheds, and even chaffing, pulping and grinding, could be done by the horse department of the farm, or by others who have nothing to do with the cows directly, while one or two specialists do the milking. Otherwise the total amount of labour connected with the cows is rather increased, because there is the daily cleaning and fettling up of the machine in addition to the work that remains the same as before.

Personally, my own experience with the milking machine was very discouraging, but I do not despair of ultimate success. There will always be a proportion of cows that will never take to it—about 5 per cent. in my own experience—and these, of course, will have to be eliminated as “not domesticated” enough. The number of users who report successful use for from six to nine years is astonishing, and would be completely convincing if it were not for the fact that everybody knows privately of many others who tried it and failed. It is just possible that the standards of success are not the same, and some are pleased and continue the use where others would give up. The fact that there is no saving—but rather an increase of the labour—is a disappointment to many. Nevertheless, in view of what has happened in connection with the introduction of other farm implements and machines, I am hopeful for the future. It has taken just exactly 90 years to bring the mowing machine and the string binder to their present state. Steam cultivation after 60 years has not been a success and only promises success now when petrol is taking its place. The threshing machine has reached its present state of imperfection after about 130 years; and so on with almost every other implement. We have had milking machines going now for about 50 years, and the inference is that if we keep on trying long enough we will get there in time.

It is worth while in this connection to see what our neighbours across the seas are doing. In the Colonies and in the United States, the labour question has always been far more acute than it has been here up to the present. Milking on a large scale has always been impossible where the “hired help” could “down tools” always at a day’s notice and move on elsewhere. Consequently, dairies of 10 to 20 cows are common where the farmer or his family can do all the milking without help. Under such circumstances, the invention of a successful milker has always been eagerly striven after, and there is quite a crowd of varieties on offer. I see a large number of Colonial and American farm papers weekly, and I estimate that there have been about 20 kinds of machines advertised which are quite unknown to us here in this country. To judge from the illustrations they are mostly on the same principles as those at home: a sucking action plus a squeezing of the teat with rhythmic pulsation; but there are always some differences, and of course a different name. At the Panama

Exhibition, held at San Francisco last year, the milker which won the grand prize over all others is called the "Calf-Way," and has a teat cup which is very different from any I have seen in this country and which works in a very different way according to the published diagrams. I presume that our home inventors have made themselves familiar with what has been done abroad, for it is just possible that some of these foreign ones contain the one little improvement which makes for success. I cannot find that any of those on offer, however, have had any great success in continuous farm work, and on the whole they appear to have arrived at the same stage of development as we are, and are still anxiously questing after a machine that can be depended on. The continuous use of many of the machines already on the market for several years is a hopeful sign, and certainly there will be a great development in this line immediately.

MILK RECORDS.

The taking of milk records is only in its infancy. I do not know who was absolutely the first to start this matter, but the first public action was taken by the B.D.F.A. in 1885. At the general meeting at the Show that year, a paper was read by the late Dr. Fream on "Milk Records." I was one of those who started the work immediately after, and when our Association offered gold medals for this I was fortunate enough to win one of them. It is only quite recently, however, that such records have been put to any practical use. I found in my own case that the annual drafting out of the worst cows had very little effect in raising the average yield, because there was always a proportion of fresh ones bought in and of those of one's own rearing that were inferior, and so kept down average results in spite of selection. It is only within the last few years that the bulk of dairy farmers have realised that improvement can only come through the bull, and that the milking pedigree of the sire is of most importance in improving a dairy herd. The result of this is that nowadays every one who is trying to improve his milk yield is most concerned about the gallons that are behind his bulls, and gets as good animals as he can possibly afford. This last year has seen the first of the milk recording schemes under the superintendence of the Board of Agriculture, and the result has been so far successful that it is safe to prophesy a great and increasing development in this matter. Hitherto we looked on a yield of 600 gallons per annum as very good, especially as the reputed average of the cows of the United Kingdom has been put at 450 gallons; but recording and selection have shown that the 1,000-gallon cow may quite easily in time be made the standard to aim at. This figure has been exceeded in countless individual cases in this country, and especially so in the United States, where recording and selecting has been longer in practice. Even after allowing for the difference between the American and the British gallon, and the practice of faking up cows to give great yields, which has been common in the States, there remains a whole host of animals which *bond fide*

have given enormous yields, and I do not see why we should not be able to get the same results here in the immediate future.

There is a great shortage of cows in this country at the present time, but this milk-recording business is showing us that we have yet far too many. If we "scrapped" about a third of those we still have it would be a national and individual service. It is no exaggeration whatever to say that 30 per cent. of our animals are kept at a dead loss; the milk they yield does not pay for the food and the labour and the other items of expenditure, and it would be a service to humanity to turn them into beef, and this is what will be done in the near future. This means that fewer cows would be kept, less food wasted, less labour required, but the milk produced would not be materially reduced. This, indeed, will be one of the most important and far-reaching results of recording in the immediate future. I do not think that we have yet reached the best way of taking a record, but undoubtedly we are now on the right lines.

FEEDING.

It is remarkable what advances have been made in the matter of rationing our cows, and the inference is that still more will be done in this line. Apart from the question whether the feeding "standards" laid down in text-books—which were originally made in Germany—are right or not, it can be quite easily understood that haphazard feeding was all a mistake, and the substitution of some method was bound to yield improved results. The work done in the keeping of milk records has incidentally thrown a flood of light on the matter of feeding as well. It has been quite common to find that when the amounts of food given per head were worked out on the standard of market values and compared with the amount of milk yielded, the cost per gallon was double in some cases what it was in others. The necessary result was that the expensive rations were reduced with benefit all round. I heard one man say that he thought he knew everything about cows, but when the recording and rationing was worked out by the visiting official of the association to which he belonged, and he found his costs came out at 2d. per gallon above the average, he had his eyes opened, and set about putting the matter right. Many years ago, when I first began to pay attention to the feeding question, I found I was giving 4s. 6d. worth of cake and meal per head weekly. A friend suggested that I try 2s. 6d. I did so, thereby reducing the cake bill on 60 cows by £6 per week. The milk yield was reduced some 35s. thereby, but a saving of about four guineas was effected, or equal to a reduction in the cost of production by 1d. per gallon. Concurrently there was an improvement in the general health of the animals, less milk fever at calving, and so on.

In a general way farmers are acquainted with the facts connected with feeding nowadays, and while they may not know enough about albuminoid ratios to calculate out these things for themselves, yet they know and believe in these principles, and are guided by them either directly or indirectly.

In the future it is certain that these matters will be carried out still more efficiently and thoroughly, and there will neither be over-feeding nor underfeeding.

Another matter that has been coming to the front lately, and is going to be a leading factor in the future purchasing of foods, is the comparative value of the food "units" in different commodities. Among the multiplicity of foods on offer at different prices in the market it is difficult for one to know which is the cheapest to buy when food value is taken into account. Valuation on the "food-unit" system supplies the information. A unit is the 100th part of a ton: the digestible percentages of albuminoids and of oil are taken, multiplied by $2\frac{1}{2}$, and added to the percentage of carbohydrates: the total represents the "units" in a food, and if the price is divided by this sum it gives the comparative value of a "unit" of that commodity. The Board of Agriculture now issues a monthly table of these comparative values of the principal foods on offer in the market (the Scottish Board does it weekly), and at present the cheapest items are wet brewer's grains, ground-nut cake, maize gluten feed, decorticated cotton-cake, and cocoa-nut cake, and the dearest are rice meal, common cotton-cake, peas and oats, with about twenty others coming at intermediate prices. The prices constantly vary of course with the rise and fall of the markets, but the point I want to emphasize is the future development of this method of selecting the foods to use. Hitherto we have been using the foods we had at hand or on offer without making much inquiry as to food value; undecorticated cotton-cake for instance has been a favourite food with milk producers, but this method of inquiry shows that it is among the dearest, and that the decorticated variety is 30 per cent. cheaper. Similarly rice and oats are not admissible, while maize, gluten, and ground-nut cake are the cheapest things to be had. This method of selecting foods is going to have a marked influence in the near future in choosing the foods to purchase, and will enable us to judge of the real value of "compound" cakes and meals. Attempts were frequently made before the present time to get at the comparative values of foods in various ways. The system of calculation by "calories" or heat units that would be yielded by burning one gram of each was one way; the summing up of the percentages of nutrient ingredients after reducing all to "starch equivalent" was another; now we have hit on a better—the money value in the market of the starch-equivalent unit. This has opened the door to working the whole scheme of scientific feeding on a basis of market prices, and my opinion is that the near future will see a very great development of this idea in the cheapening of the outlay for food on a dairy farm, and a concurrent reduction in the cost of producing milk. Recent investigations have shown that it is quite possible to grow milk very expensively by the use of ordinary farm foods like hay and mangolds, and that to substitute some purchased food would reduce the cost, but we are only finding out these things now, though the human race has been handling cows for at least ten thousand years, and the next few years will show wonderful strides in this direction.

PRICES.

Most men connected with the dairy trade are wondering how the prices will pan out in the future. As long as the prices of food, wages, and all the other etceteras remain high, then the price of milk and its products must remain high also. Per contra, if these decline then also will the milk figures go down somewhat. I say "somewhat," because there are various other influences at work which must be taken into consideration. Last autumn two of our leading dairy farmers worked out the percentages of rise in the various items concerned in the production of milk from the Board of Agriculture reports, and found that they ranged from 14 to 60 per cent., the average being 36. Since then there has been a further rise, so that at the moment of writing it probably stands at, say, 50 per cent. If in the course of time this rise disappears, and the costs go back to their old figures, then milk will also go down, but never again to its old figure.

To understand this it is necessary to go back some 25 to 30 years ago. At that time wheat farming meant utter bankruptcy, while beef and mutton were little better, and many farms throughout the South were absolutely derelict. On the other hand, milk was a good price—at as high a figure as it is now—while the excessive cheapness of food and plentifulness of labour made it correspondingly more profitable. As a result, dairy farmers from the North crowded down on to the "corn and horn" farms of the South. I was one of the pioneers myself, and started cow-keeping. Matters are very different now, however. Wheat and all other food products are very high, and even if we allow for a big decline later on, we shall never see the low prices of old times so far as I can foresee. The prairies and the cattle ranges of "the West" have shot their bolts, and no other regions of the world are likely to repeat their performance on the same scale. This means that other kinds of farming are now competing with dairying for the use of the land, and unless there is going to be an extra good result from the dairy then it will be dropped. But a "good result" from dairying means more than appears on the surface. Referring to the question of labour again, the milking of the cows is the most troublesome job on the farm. The lack of a horseman means that the horses can be turned out to grass until a man turns up to work them, and very little harm is done; the lack of a milker means that from 12 to 15 cows are upset—and milk yielding is a very delicate and ticklish process—and we cannot turn them out to grass and let them run till a milker turns up. All this means that the management of cows is a perpetual worry to the owner—Sundays as well as week-days.

Further, since the days of a quarter of a century ago, the question of sanitation has immensely developed, and the cowsheds, dairies and appurtenances have to be on a very different scale from that of old times. Much of this was needed, though we have had too much of the faddism of half-trained officials, but the point is that it costs money, and the price of the produce must be high enough to cover this and the worries associated with it. And yet again there is another

matter. The institution of the "milk standard" of analysis has led to the vindictive prosecution of many decent men in cases where the milk fell below that standard. If magistrates and medical officers of health had "played the game" and observed the rules laid down by the Board of Agriculture, there would be nothing to complain of, but as it is there are many, many men sick of the whole thing, and are now thankfully dropping out of the cow line altogether and going back to arable farming and other kinds of stock. This explains why there are half a million cows in the country less than before, and why so many "sold off" quite recently. In my own locality I counted up the numbers of cows sold off last Michaelmas and they amounted to about 500, as advertised in the local papers, and the incoming men only replaced a part of this number.

All this means that a high price must be paid for milk; that the labour question must be eased; and that the M.O.H. must slacken off some of his senseless proceedings. The alternative is that no man is compelled to keep cows to be badgered to death or to lose money, and he can easily drop them and do better in other lines. My own farm was a great wheat farm at one time; the motor plough could easily make it one again, though I would dislike selling off the cows I have spent years in breeding, but they could easily be sold at a high price, and I want a high price for their produce to make me stick to them.

CONCLUSION.

It will be seen, therefore, that the future of dairying depends on three things—labour, prices, and the vagaries of officialdom. In any case, the farmer holds the whip hand, for if any or all of these don't suit him, he can drop the whole job and do better in some other line of farming that pays better. Anyway, there will likely be a further decrease in the number of cows; the fewer we have the better will the labour difficulty be met, while the reduction will be due to the elimination of the inferior ones, leaving the best in stock. The extra number of heifers which the returns show to be coming forward will not replace those drafted out.

During this last twelvemonth or so it has been particularly aggravating to feed hay to cows which could have been sold at £5 per ton or more, and to buy cakes at double the prices of former years, and all without any adequate return. There has been a great and increasing want of efficient labour to handle the cows. The Board of Agriculture has found it necessary to circularise the local authorities to call attention to the regulations regarding prosecutions in connection with the analysis of milk, and many of these have received the directions with contempt: and so on. These matters are very near the "end of their tether," for if they are not righted very soon, then dairy farming will grow less and less as one after another drops out in disgust, and the price of milk and its products will have to mount higher and higher to entice anyone to take the risk and trouble and expense of producing it.

DAIRYING IN NEW ZEALAND.

By WALTER WRIGHT, Inspector of Dairy Produce, New Zealand Government.

THE Dominion of New Zealand is peculiarly adapted for dairying purposes. Owing to its geographical position it is favoured with a temperate climate, there being no extremes of heat or cold, and an adequate rainfall. The islands comprising the Dominion are of volcanic origin, with broken and irregular contours, the water supply thereby being plentifully and equably distributed. Unlike countries of greater area, there are no great tracts of plain or flat country, the surface being very variable, comprising level, undulating, hilly, and high mountainous country. A land of this peculiar formation lends itself to all classes of agricultural, pastoral, and horticultural pursuits: those interested in farming in the Dominion have not been slow to recognise the great possibilities of the dairying industry, and for some twenty to twenty-five years steady progress, organisation, and development have taken place.

DEVELOPMENT OF EXPORT TRADE.

The export trade in dairy produce began as far back as 1860, but for many years the quantities were small, and increased in volume at a comparatively slow rate.

In 1885 the total export of butter was only 24,933 cwt., and that of cheese 15,245 cwt., but in 1890 the quantities had increased to 34,816 cwt. and 40,451 cwt. respectively. During the early days of the industry the shipments of butter and cheese to the Australian provinces were considerable, but it was not long before the English market absorbed practically the entire output. At this period it was recognised that for the building up of a solid export trade markets could be secured only by supplying butter and cheese of a uniformly high standard of quality.

The following table will give some idea as to the rate of the development of the export trade during the five years ending March 31st, 1914 :

| YEAR. | TOTAL BUTTER EXPORTED. | | TOTAL CHEESE EXPORTED. | |
|-------------|---------------------------|-----------|---------------------------|-----------|
| | Weight. | Value. | Weight. | Value. |
| | Cwt. | £ | Cwt. | £ |
| 1910 | 339,227 | 1,984,477 | 453,865 | 1,317,208 |
| 1911 | 350,172 | 1,873,430 | 445,062 | 1,279,552 |
| 1912 | 342,708 | 2,056,248 | 512,093 | 1,760,724 |
| 1913 | 375,471 | 2,196,505 | 650,001 | 2,112,503 |
| 1914 | 398,691 | 2,312,407 | 737,514 | 2,323,169 |

The principal market for New Zealand dairy produce is the United Kingdom. Although from time to time quantities of butter and cheese are being exported to U.S.A., British Columbia (Vancouver), South Africa, Australia, and South Sea Islands, the total quantity so exported is comparatively small.

In reading the above table it will be noted that the output of cheese has been advancing very rapidly when compared with that of butter. The rapid expansion of cheese manufacture is, no doubt, largely due to the high prices that have been ruling for some time now on home markets, and for this reason this branch of dairying has proved to be more remunerative than that of butter-making.

CO-OPERATION IN DAIRYING.

In the early days of the industry the dairy factories and creameries were chiefly the result of private enterprise. Gradually, however, the principle of co-operation was evolved, so that to-day there are but few proprietary concerns to be found in connection with dairy factories or creameries in the Dominion.

The formation of dairy factory companies upon co-operative lines had a zealous advocate in Chief Instructor John Sawers, who during 1892-3 toured the Dominion delivering his lecture on "Co-operative Dairying as an Economic Factor in the Prosperity of New Zealand Agriculture." This tour was of a very thorough character, and it is doubtless very largely due to Instructor Sawyer's activity at this time that this system eventually came to be universally adopted in New Zealand. About that time the creamery and factory system may be said to have become fairly well established, and future developments amply fulfilled the promise of rapid expansion of this method. In that year there were only 47 creameries and cheese factories in operation, but in 1905 the number had increased to 298, with the addition of 448 skimming stations. In 1914 this number had increased to 474 cheese factories and creameries, with a decrease of 74 in the number of skimming stations. The probable cause of the decrease in the number of skimming stations was due to the change-over from butter to cheese on the part of some dairying concerns, when a number were converted into cheese factories. The growth of home separation of cream was also responsible for the closing of the remainder.

In addition to the afore-mentioned there are 102 private dairies for butter and 23 for cheese. These are not, however, classed as creameries or factories; but the owners of dairies of 50 cows and over are required to register their premises, as otherwise their produce cannot be exported.

The system of co-operation in dairying has much to commend it. By this system the cost of manufacture is reduced to a minimum, and there is also an economy of labour. The resultant output of produce is more uniform in quality than is the case when the manufacture of the same quantity of butter and cheese is carried out on the farms, where many individuals are engaged in manufacturing small quantities under

very adverse conditions owing to the inability to control temperatures and the lack of up-to-date appliances.

Before the universal adoption of the creamery method in the Dominion it was rarely indeed that farmers could obtain more than 4d. to 5d. per lb. for their butter, but to-day, under a well-organised co-operative system, the farmers have received as much as 1s. 1d. per lb. for butter-fat for butter-making and 1s. 3d. per lb. for butter-fat in cases where cheese is manufactured.

FORMATION OF CO-OPERATIVE DAIRY COMPANIES.

When a district has developed sufficiently, and there is an ample number of dairy cattle available, the general practice is for someone to convene a meeting of the farmers of the district to discuss the matter of co-operative dairying. If it is decided that there is a sufficient guarantee forthcoming that will enable the manufacture of either butter or cheese to be carried out satisfactorily and profitably, a provisional committee is formed and the necessary articles of association drawn up. In due time another meeting is called to arrange the final details and to appoint a board of directors, who then take charge of all matters of finance, construction of buildings, &c. Each farmer becomes a shareholder, and has shares allotted to him according to the number of cows that he has undertaken to milk—the general practice has been to allot one £1 share per cow.

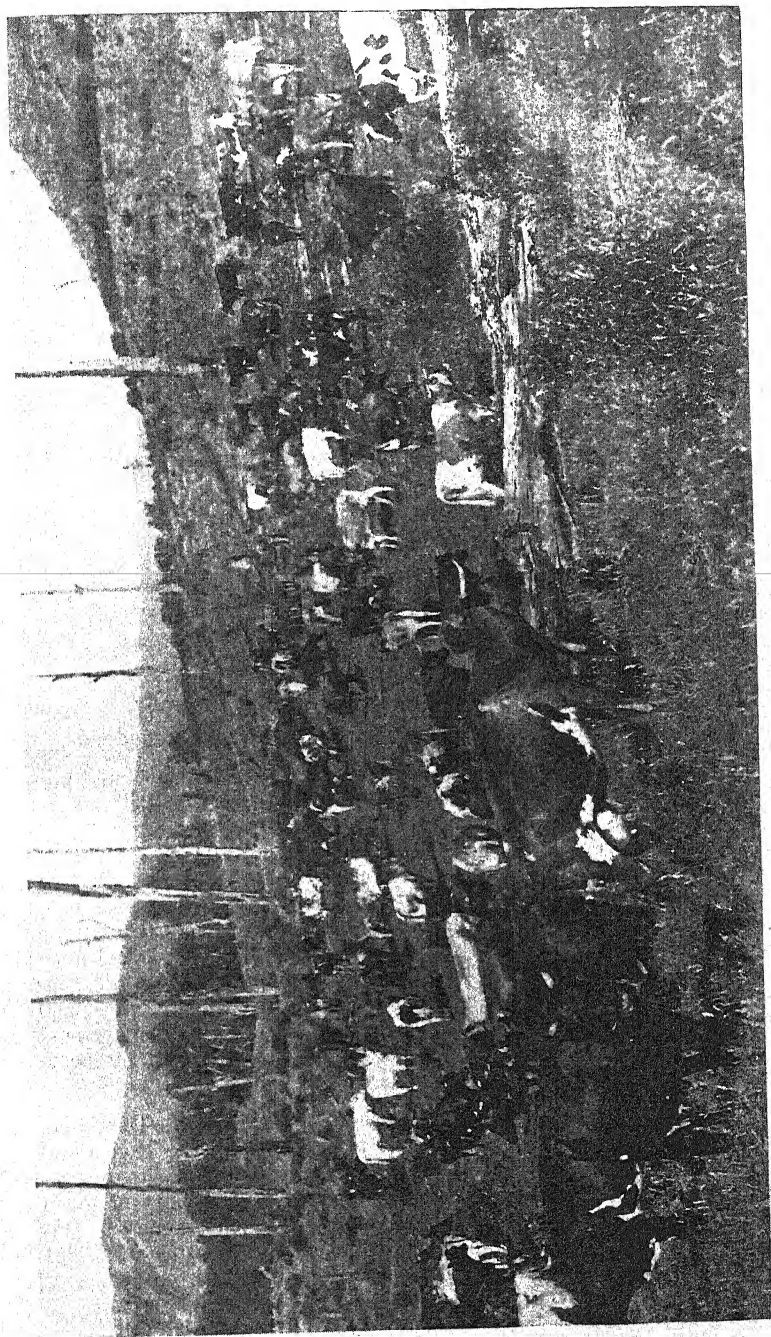
The Dairy Act provides for financial assistance to co-operative dairy companies if required, for the purposes of acquisition of land for the site of the factory, erection, acquisition, or extension of suitable buildings, and the supply and erection of suitable plant and machinery for such factory, providing that the farmers themselves subscribe to the extent of utilising at least one fourth of the capital for these purposes.

NEW ZEALAND DEPARTMENT OF AGRICULTURE.

The only advisory, instructive, and control organisation in agricultural matters is the Department of Agriculture. These remarks do not apply, however, to the work of dairy instruction carried on of late years by the Department of Education, in suitable districts, which provides for a certain amount of theoretical and practical instruction of an elementary nature.

Some few years ago it was thought that it would prove advantageous if an advisory board were constituted, which would contribute to the more efficient working of the Department. This idea was eventually put into practice, with the result that a Board was appointed which is comprised of gentlemen of practical experience in all branches of agriculture and who reside in different parts of the Dominion. By this arrangement the advantage was gained of obtaining first-hand knowledge and requirements of local conditions throughout the Dominion in dealing with matters of importance to agriculture generally.

On account of this development it became necessary in 1909 to reorganise the whole of the work of the Department of Agriculture,



CROSSBRED HERD, NEW ZEALAND DAIRY FARM.

which entailed a readjustment of duties under divisional heads. The Department is now, therefore, divided into several divisions, each having a director at its head who is responsible for the duties of his staff and also for the efficient working of the division generally. The Dairy Division is one of these. The director is assisted by an assistant director and a staff of instructors, inspectors, and produce graders. The inspection of farms that supply milk for use in towns and cities, and all that pertains to the usual routine of the retail dairy business, is carried out under the direction of the Live Stock Division, but all matters relating to milk that is intended for the manufacture of dairy produce comes under the jurisdiction of the director of the Dairy Division. The responsibilities of this division may be classified as follows:—

- (a) Grading of dairy produce.
- (b) Instruction in the manufacture of butter, cheese, casein, &c.
- (c) Inspection of dairy factories and premises of farms supplying dairy factories.
- (d) Control of semi-official testing of the production of pure-bred dairy cows.
- (e) Formation of cow-testing associations.
- (f) Supervision of the export of dairy produce.
- (g) All matters appertaining to dairying generally.
- (h) Inspection of dairy produce in the United Kingdom.

Contingent upon the rapid development of the industry, and notwithstanding the satisfactory position it holds to-day, there still remains a great deal to be done in various directions. Considerable difficulty has been experienced in the endeavour to maintain a high standard of quality and at the same time keep pace with the development that has taken place during the past few years. Periodically it has been found necessary to make additional appointments to the staff on account of the increased work that the division has been called upon to undertake in the various branches of the industry, and to fill these appointments selections are made from among the leading butter and cheese makers whose records of creamery and factory management have been satisfactory and who have become familiar with the peculiarities of Colonial dairying methods.

In addition to the general supervision of dairying in the Dominion, an officer of the division is attached to the office of the High Commissioner for New Zealand in London, whose duty it is to inspect shipments on arrival, investigate complaints, and to keep in touch generally with all that relates to New Zealand dairy produce in this country. By this means the director of the Dairy Division is enabled to obtain direct information regarding the quality of the produce as it reaches its destination.

DAIRY ACT AND REGULATIONS.

In 1908 a Dairy Act was framed and became law. This Act is a consolidation of all previous Acts, and based upon it are the necessary regulations for the control of dairying generally. Since that time amendments have been adopted which deal with different phases of the industry as it becomes necessary.

The Act provides for the appointment of inspectors of dairy stock and factories and other places used in the manufacture of dairy produce, and power is given to forbid the use of or to condemn such places if necessary. The sale of unwholesome milk or other dairy produce is prohibited, and provision is made for the inspection, grading, and shipping of all produce exported.

Provision is made for the framing of regulations for the registration of dairies, licensing of persons carrying on the manufacture or sale of the produce, registration of trade marks or brands, and for inspection and grading.

A fine not exceeding £50 may be inflicted for any offence under this part of the Act.

VETERINARY.

The responsibility of maintaining in good health the live stock of the Dominion rests upon the director of the Live Stock Division and his staff, as does also the supervision by inspection of all dairy farms and buildings where milk is produced and treated for city consumption; the usual retail milk shops and dairy premises receive the same attention. With regard to the health of dairy herds, the stamping out of tuberculosis in the cattle receives particular attention on the part of the veterinary officers and stock inspectors, and the elimination of this disease in dairy herds is rendered the more successful by the fact that for a number of years tuberculosis has been scheduled in New Zealand as a "Contagious Disease." Apart from periodical inspection by the officers of the Department, the onus is upon the owner to report any cases of disease or suspected disease which come under his notice and upon receipt of such information examinations are made of the suspected animals by the veterinary staff. As tuberculosis is, as above stated, a notifiable disease, the presence of this affection in any degree results in either complete isolation (with withdrawal of the milk from consumption) or immediate slaughter; in the latter case the owner being compensated to the extent of one-third of the market value of the animal or animals when they have been destroyed. Further, steps are taken by means of the tuberculin test, to eliminate the disease from dairy herds as much as possible, this being carried out either at the request of the owner or as a compulsory measure in the event of suspicious cases being present. When animals react, they are either isolated or slaughtered and thus prevented from spreading infection through other herds, as would happen if they were allowed to be sold. The slaughtering is done in the presence of a representative of the division, who directs what is to be done with the carcase or carcases. The usual practice is to remove the carcases to the digester

and eventually convert them into manure. Stock inspectors attend all cattle sales in their districts, a practice which is found to be of much assistance in locating unhealthy stock.

DAIRY HERDS.

The dairy herds are composed chiefly of the following breeds:—Friesian, Shorthorn, Jersey, Guernsey, Ayrshire, and their crosses, all of which are well represented. Various other British breeds and their crosses are also to be seen, but not to any great extent.

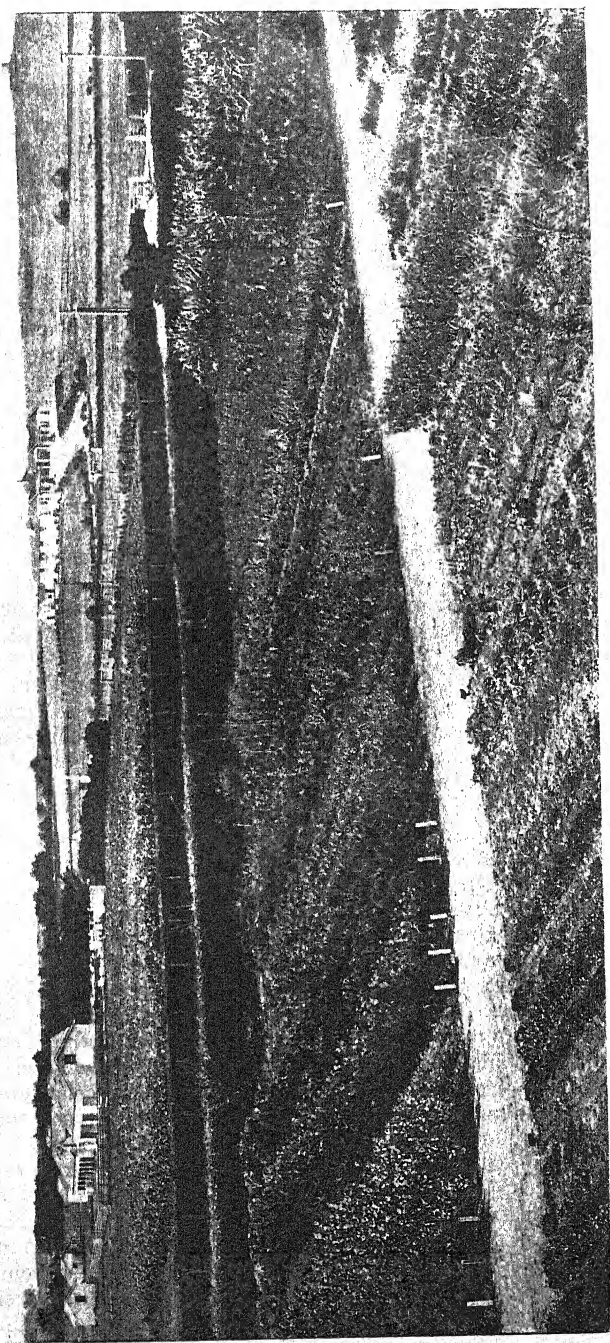
The following figures give the estimated number of cows and heifers, over two years old, for dairy purposes in the Dominion for the year ending March 31st, 1911:—Dairy cows, 633,733; heifers, 170,345. These figures show an increase over the estimate for the year 1906 of 212,761 cows and heifers. This large increase of dairy cattle is fairly equally distributed throughout the Dominion. Stud dairy bulls are not enumerated separately, but their number is included in the 29,068 stud bulls for all purposes. The distribution of dairy stock is of interest. The dairy cows and heifers in the North Island numbered 591,789, or 74 per cent., and in the South Island 212,289, or 26 per cent. These figures also serve to indicate where the bulk of dairying districts are in the Dominion.

THE DAIRY DIVISION.

Since the formation of this particular branch of the service there have been several changes at the head. By the judicious selection of the men to carry out the work of administration, the dairymen of the Dominion have had the advantage of the services of several well-known Canadians, namely, J. B. MacEwan, J. A. Ruddick (at present Food and Cold Storage Commissioner, Canada), J. A. Kinsella, and Wm. M. Singleton. Nor has the Homeland been neglected, for Scotland has given to New Zealand the well-known family of Sawers, who hail from Wigtownshire. The Sawers Brothers, who have proved themselves to be past masters in the art of cheese-making, have for many years been well known in the Australasian dairy world. Mr. John Sawers was for some time Chief Dairy Instructor, and is now located at Edendale, Southland, and his brothers James and George are Dairy Instructors in New Zealand and Victoria respectively at the present time. William was for many years one of the recognised leading cheese-makers in Otago. Denmark has also been drawn upon for the supply of butter experts, and the names of Sorenson, Busck, and Pederson, are familiar with New Zealand dairymen.

Since the year 1906 the direction of the division has been in the hands of a New Zealander in the person of Mr. David Cuddie, whose geniality, tactfulness, and able administration of his division have assisted in no small measure toward the successful expansion of the dairying industry of the Dominion to its present extensive dimensions.

During 1907-8 Mr. Cuddie visited the United Kingdom, Canada, and Denmark, and the early application of herd-testing to dairying in the Dominion is doubtless largely due to his visit to the last-named country.



GOVERNMENT EXPERIMENTAL FARM, RUAKURA, NEW ZEALAND.

INSPECTION OF DAIRY FARM PREMISES, &c.

In 1908 the importance of the necessity of inspection of milking-sheds, milking-machines, &c., came to be fully realised, and this work is now included in the routine of the Dairy Instructors in the various districts. As all the milk is delivered to the factory or creamery only once daily, it is essential that the night's milk should be kept in some sanitary situation while awaiting delivery; for this reason all milk stands are required to be at least two chains away from the milking-shed and in the direction of the prevailing wind.

Grading of dairy produce is found to be of great assistance in watching the quality of the produce as it comes forward for shipment, and by reason of the efficient methods adopted the dairy companies and managers are speedily advised regarding the quality of their produce. When any inferiority is found in any particular parcel, the instructor takes the matter up, visiting the factory or creamery, and following the matter to the source of the trouble, which is very frequently found to be the milk supplied by perhaps only one or two individuals. I mention this as illustrating the connection between the grading of the produce, instruction in manufacture, and instruction on the farm, as is the case in New Zealand. There it is recognised that without sound, clean-flavoured milk to work upon it is hopeless to expect that the resultant butter or cheese, or other products will be of a high standard of quality.

MILKING MACHINES AND THEIR USE.

In view of the frequent discussions that arise from time to time regarding the effect of and the use of milking machines in this country, I feel that this article would not be complete without at least a passing mention relative to the use of milking machines in New Zealand.

In 1893 the use of mechanical milkers began to attract the attention of dairymen, and from that time onwards their use became more general. The number of milking machines now in use in the Dominion may be said to run into thousands, and this number has been reached within a comparatively short time, it having been only a few years since their introduction. Since then numerous new patents and improvements of parts of the machines have been put on the market, and many of these new patents are due to the inventive genius of New Zealanders themselves. Shortage of and the high cost of labour for milking has without doubt been the primary cause of their finding favour so rapidly with Colonial dairymen, and in cases where the herds number, say, 40 head or over, the economy of labour is very considerable.

The milking machines of to-day as at present constructed are, however, far from being perfect, and their use is a source of great anxiety and annoyance to the keen butter or cheese maker, especially when the machines are in the hands of uncleanly or careless individuals.

The use of rubber tubing in machine milkers is the most undesirable feature in their construction, and is one of the greatest menaces to the quality of dairy produce that I know of. Rubber being of a porous nature and a material which butter-fat has the power to destroy, so that even when the most scrupulous care is taken in the cleansing

of the rubber parts especially, it is practically impossible to render those parts sterile. The great danger, therefore, of inoculating each lot of milk as it runs through the tubing with undesirable bacteria is always present. I do not wish it to be understood that I condemn the use of milking machines in their entirety, far from it, but what, in my opinion, is urgently required is some material that will displace the use of rubber altogether in the construction of mechanical milkers. The material must be of a flexible nature, non-porous, and of such a character as to be impervious to the action of milk or its component parts. If such a substitute were evolved it would prove a great boon and blessing to dairymen, and would also greatly assist in bringing the machines into more general favour. Another point is that the greatest care on the part of milkers is most important. The teat cup should never be attached to a cow until the milker is satisfied that all the quarters of the udder are sound and the milk fit to use.

EDUCATIONAL.

At the present time there are no Dairy Schools or Colleges in the Dominion at which butter and cheese makers can obtain an insight into the scientific side of dairying. In 1895 the first schools of instruction were organised and were repeated the following year, but the courses were only of short duration and held during the winter and spring months. In addition to classes for the practical instruction in butter and cheese making, courses of lectures were given during the term of the dairy school upon the undermentioned subjects:—

- "Business Relations of the Managers to Milk Supplies."
- "Managers' Responsibilities."
- "Composition of Milk and Dairy Products."
- "Treatment of Milk for Cheese and Butter Making."
- "Practice and Principles of Cheese and Butter Making."
- "Milk Testing."
- "Paying for Milk According to Quality."
- "Dairy Bacteriology" (Elementary).
- "Pasteurising Milk and Cream."
- "Working Separators."
- "Dairy Machinery and Refrigeration."
- "Aeration and Care of Milk."
- "Grading and Inspection of Butter and Cheese."

The number of students that attended the classes was very satisfactory, there being 200 at the South Island school, and 107 attended the following month at the dairy course that was held at Stratford in the North Island. This system of instruction was not continued, and, with the exception of a few short courses during Mr. J. A. Kinsella's *régime* in 1900, no other classes have been held. The instruction, apart from the schools referred to, is of a purely practical nature, and is imparted to the cheese and butter makers at the various factories and creameries during the course of the season's work and on the occasion of the visits of the instructors. There are, however, several State farms situate in the Dominion, but these are used mainly for demonstration purposes, and, except at three of the State farms, no

special attention is given to dairy problems. There is also an agricultural college at Lincoln, where students are received who desire to go through the various courses, but I do not enlarge upon the advantages of these institutions, as they do not apply directly to the subject under review.

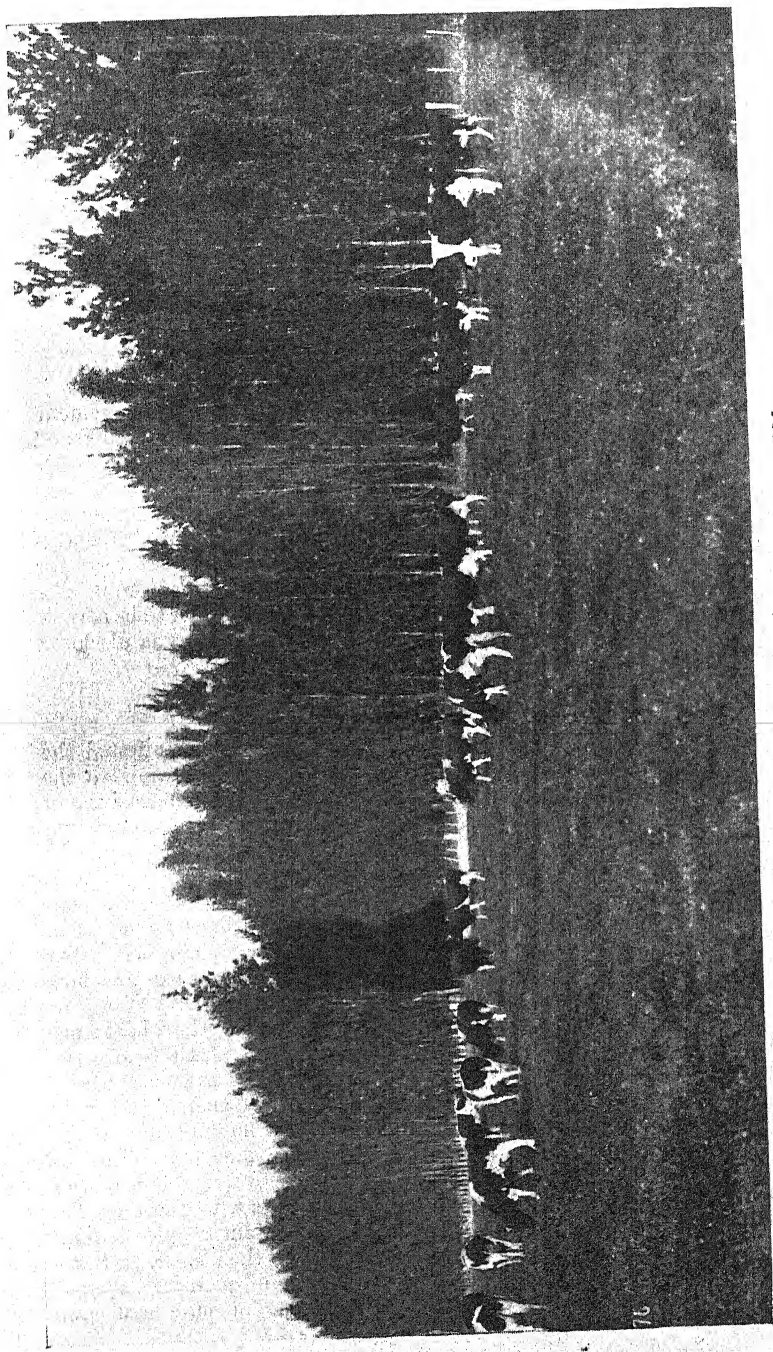
CO-OPERATIVE HERD-TESTING OF PRODUCTION OF DAIRY COWS.

To encourage dairy farmers to improve their herds by testing the respective merits of individual cows, in the spring of 1909 the Dairy Division of the Department of Agriculture, with the co-operation of the Dalefield Dairy Company, established a model cow-testing association amongst the members of that company. The object of the association was to grade the herds up to a higher producing capacity and to ensure more accurate information regarding the yield of individual cows. The results proved satisfactory, clearly demonstrating the value of such associations, and since then many other cow-testing associations have been formed.

The rules governing this movement are somewhat along the same lines as those of similar associations in Denmark. For the information of my readers I give hereunder a copy of the rules governing the work as it is carried out in the Dominion:—

ARTICLES OF ASSOCIATION.

1. The name of the Association is "The Cow-testing Association."
2. The objects for which the Association is established are :
 - (a) To encourage improvement in dairy cows by weighing, testing, and figuring the yields of milk and butter-fat of cows owned by members.
 - (b) To encourage such improvement by any other legitimate means.
3. The officers shall consist of a chairman, a secretary, and a treasurer. Three other members shall be appointed to act with these officers as a committee of management; or, the committee of management shall be those who have been appointed officers and directors of the co-operative dairy company to which members of the Cow-testing Association supply milk.
4. The duration of office shall be one year, or until successors are appointed; or, the committee of management being the directors of the co-operative dairy company, the company's rules shall apply respecting duration of office.
5. Meetings of the committee of management shall be held at the call of the chairman, through the secretary. Three members shall form a quorum. The annual general meeting shall be held every year at such time and place as shall be determined by the committee of management. Members shall have one vote for every twenty-five cows or fraction thereof which are being milked by them and are being tested.
6. The committee of management shall make arrangements for testing the samples and figuring the returns for members of the Cow-testing Association.
7. The cost of this work shall be provided for as under:—
 - (a) For each cow to be tested, the owner shall pay one shilling at the time of the first test.
 - (b) Further payments to be made as necessary, and at the call of the committee of management.
 - (c) All payments by members to be made on the basis of a general rate per cow.
8. Each cow once tested shall be counted as a cow for the season. After one or more tests, she shall not be replaced by another cow.



HOLSTEIN HERD, WERAROA STATE FARM.

BY-LAWS.

1. Any dairy farmer supplying this co-operative dairy company will be admitted to membership if he agrees to weigh and sample the milk of each and every cow in his herd night and morning for two consecutive days each testing period.

2. Members shall provide balances for weighing the milk, a dipper for sampling, a sample bottle properly numbered for each cow, and a box for holding these bottles.

3. Members shall undertake the delivery of their samples for testing at the factory or station where the testing is done.

4. The testing shall be done by the Babcock method.

5. Any member wilfully returning incorrect weights or samples shall be refused permission to take further part in the work of the Association.

The attention and interest that has been paid to this movement by the dairymen of the Dominion have been most encouraging and augur well for the future milking capacity of New Zealand dairy herds before many years have passed. The number of these associations is increasing yearly, which seems to indicate that before long they will be general throughout the dairying districts. The remarkable disclosures of the systematic testing of dairy cows have given food for much thought and action on the part of progressive dairymen in particular. It has been found to be rarely the case for a farmer to be correct in his judgment as to which were his most profitable cows as disclosed by the result of a season's work of testing.

PURE-BRED HERD TESTING.

The extension of the cow-testing movement has manifested the need for pure-bred bulls of proved milking strains. Owing to the improved demand, breeders were not slow in availing themselves of the suggestion made by the Department of Agriculture that they should have their cows semi-officially tested. This suggestion met with the whole-hearted support of the Friesian and Jersey Associations in New Zealand, and in 1912 a practical start was made. In that season 170 Friesian and 149 Jerseys were offered for testing. Since its inception this method of testing the production of pure-bred dairy cows has been steadily increasing in favour, and Ayrshire breeders are now having cows tested by the same system.

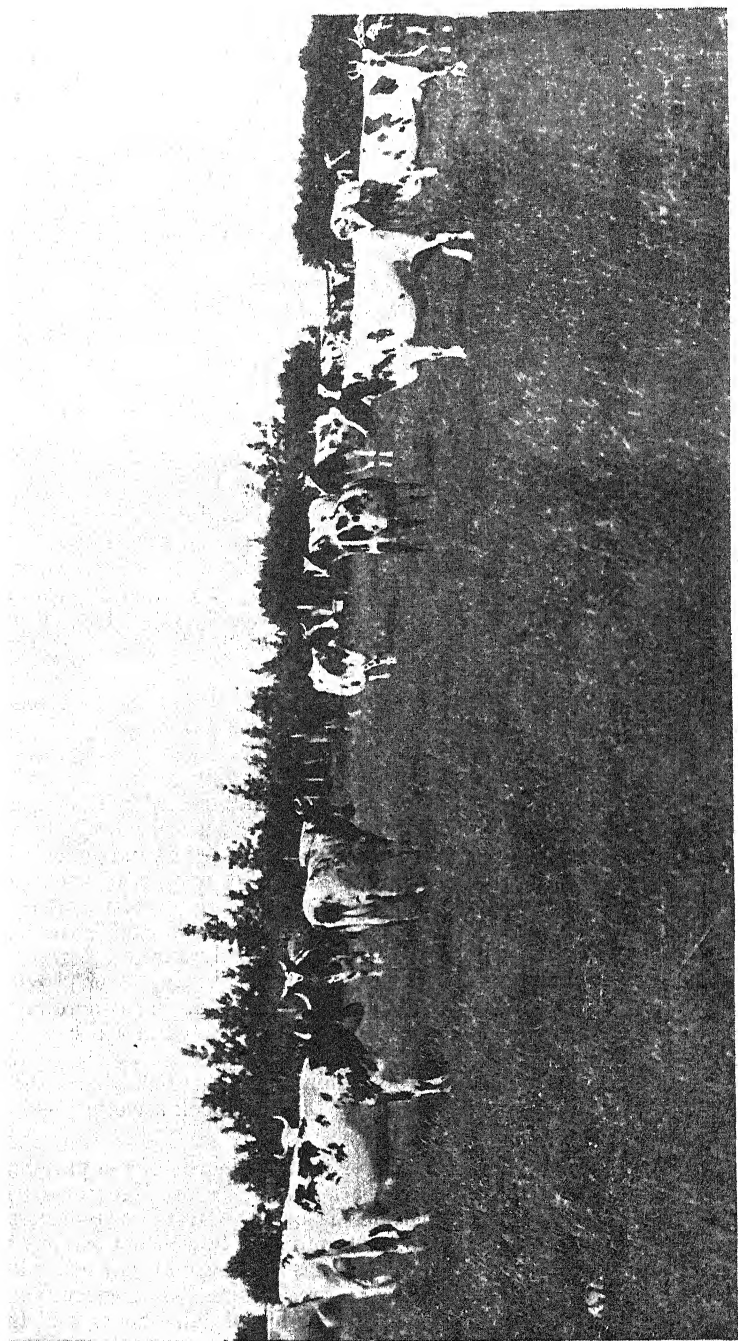
"Only cows that are registered in New Zealand Herd-books are eligible for this system of semi-official herd-testing, and before the animals are accepted the Secretary of the Breeders' Association concerned must certify that they are eligible. The owners of all cows entered have to agree to weigh the milk of every milking during the period of lactation, and a departmental officer pays surprise visits to the farm not less frequently than once a month to weigh the milk of every milking for two days, compare these weights with those of the owner for the days previous to his visit, and to obtain samples of milk for testing for butter-fat. The department will then issue, to those cows producing for the season up to the minimum quantity required by their class, certificates of merit. The owners of pure-bred cows

that are put under this test are required to pay a fee to the department for the work."—*Vide* N. Z. Year Book, 1912.

"The breeding of dairy cattle has made considerable progress in recent years. A special Jersey herd-book has been in existence for some time, and herd-book societies are now well established for the Holstein and Ayrshire breeds as well. During the past season the Dairy-produce Division of the Department of Agriculture, Industries, and Commerce proposed a scheme for establishing registers of merit in connection with pure-bred dairy cattle. This was at once accepted by the Holstein and Jersey Herd-book Societies, and during the coming season the Ayrshire Herd-book Society will also co-operate in this movement. It is confidently expected that this will give a great fillip to the breeding of pure-bred dairy stock, as it will place this work on a greatly improved plane. Its chief value will no doubt be found in the fact that the ordinary dairy farmer will be able in future to secure a bull of undoubted milking quality. He will be thus encouraged to use pure-bred bulls, and thereby to assist materially in raising the standard of the dairy stock of the country. The farmer will be further encouraged to support the breeding of pure-bred stock, by reason of the fact that he is now coming to appreciate the value of herd-testing work, and thus knowing the really profitable cows in his herd, will be anxious to secure a bull which will enable them to perpetuate their good qualities.

"A policy which has been partly responsible for placing the breeding of dairy cattle on up-to-date principles has been the establishment of pure-bred herds at three of the experimental farms of the Department of Agriculture, and there breeding them according to an exact record of performance. High-priced stock have been imported by the Department in order that the foundation herds at the farms may be of the best quality. The milk of all the cattle is daily weighed and periodically tested, official check tests being conducted by experts of the Dairy Produce Division of the department. The yearling bulls from these State milk-record herds command high values. Sensational figures have been recorded at the sales of the Holstein bull calves from the Weraroa Experimental Farm, as much as 295 guineas having been given at auction for a bull calf from the best cow of the herd. The appreciation of the farming community for this officially-tested stock has been chiefly responsible for the gratifying manner in which private breeders of pedigree stock have participated in the official register of merit scheme of the department and the herd-book societies."—*Vide* New Zealand Year Book, 1914.

With reference to the foregoing, the establishment of the pure-bred herds on a sound and satisfactory basis by Sir Thomas Mackenzie, who was then Minister of Agriculture, is one of the most progressive and beneficial measures that have been taken by the department up to the present time and which will ultimately prove of immense value to the dairying community. It has already acted as an incentive to dairy farmers to go in for systematic testing of dairy herds, and this



AYRSHIRE HERD, MOUMAHAKI EXPERIMENTAL FARM.

development will in the near future mean the elimination of "scrub" bulls, which will be replaced by pure-bred bulls that are the progeny of proved milking strains of dairy stock.

DAIRY SHOWS IN NEW ZEALAND.

During the winter months a series of dairy shows is held in different parts of the Dominion; at the same time the annual conferences of the various dairy organisations are held. On these occasions a great gathering takes place, and the importance of such gatherings and their beneficial influence on dairying generally cannot be too highly estimated.

With reference to the judging of New Zealand dairy produce, a few words regarding the New Zealand method will not be out of place at this stage, because the system is run along entirely different lines to that which is generally practised in this country. Since 1896 the judging at all dairy shows has been carried out entirely by the Director of the Dairy Division and his staff. Butter and cheese are judged on points similar to those of the regular grading system, and this system of judging at shows has given entire satisfaction to exhibitors. There is an educational value attached to this method: during the period of the show, a day and hour is arranged between the show secretary and the director of the division, when the judges will attend in order to go through the various exhibits with the makers, and when the qualities and characteristics of the various exhibits are freely discussed by the judges and the makers. By this means much valuable information is gleaned by those who attend such gatherings.

Another feature of the shows is the judging event for managers and assistants of factories and creameries, and prizes are allotted for this purpose. This class is generally well supported by the progressive men in the business and those who are keen to learn all they can about their calling.

Another unique institution is the class for competition in milk testing. These classes are open to the young sons and daughters of farmers and are as a rule well filled. The object of these classes is to encourage the practice of testing the milk among those who will, in all probability, follow up dairy farming in after-years. Milk-testing is taught in some of the primary and technical schools in country districts.

ERECTION OF (CHEESE) FACTORIES AND CREAMERIES AND THEIR REGISTRATION.

Plans of proposed new buildings intended for the manufacture of butter and cheese are submitted to the Director of the Dairy Division for his advice and approval before the work of erection is proceeded with. This is not obligatory, but it is recognised that such a course is to the general advantage of all interested, and dairy companies do not hesitate to ask advice in these matters, which is due, doubtless, to the confidence that exists between the divisional director, his staff, and all those engaged in the various phases of dairying. Before proceeding with the erection of the buildings, the question of site, water,

and drainage receive adequate consideration, and to assist the directors to arrive at a satisfactory decision it is the common practice to call in the services of the dairy instructor who is located in their particular district, and who is able to place at their disposal the knowledge and experience acquired by constant practice in such matters. Plans of creameries and cheese factories of suitable capacity are usually supplied by the department, together with an estimate of the probable cost of the plant required.

The registration of such premises being compulsory, after erection they are inspected by an officer of the department, and if everything is satisfactory the registration number is then granted and registration completed, after which the work of manufacture can proceed.

Many co-operative dairy companies have installed dual plants in their cheese factories and creameries, and in the case of those so situated it enables a rapid change over from butter to cheese or *vice versa*, to suit market conditions.

PURCHASE OF MILK ON ITS PERCENTAGE OF FAT CONTENT.

The purchase of milk or cream intended for manufacturing butter or cheese is always based upon the butter-fat content of the milk or cream supplied, and the volume of milk delivered is only used as a factor to determine the quantity of butter-fat delivered by individual suppliers. This system of paying for milk was introduced in 1895 by Mr. J. B. MacEwan, who at that time was Chief Dairy Expert, and it was due to his persistent advocacy of the equitable principles of this system that within a few years it became to be universally adopted by all dairy concerns in the Dominion. This system of payment applies to both butter and cheese making concerns. Some five years ago in one district, the farmers comprising a co-operative dairy company, whose dairy herds were made up chiefly of Jersey cattle or their crosses, the contention was raised that the payment on a butter-fat basis was not satisfactory for cheese-making, on account of the high fat content of the Jersey milk. About this time the suggestion was being advanced advocating the use of the "Hart" method of determining the casein content of the milk in addition to the fat content, as being a more equitable basis for the payment for milk for cheese-making. This system was adopted by the dairy company that I refer to, and was continued for about four years. The result of this lengthy experiment was that the company decided to revert to the usual method of payment for milk on its fat content, which system is considered to be quite equitable by all those interested in the Dominion. The samples are taken daily; each supplier has allotted to him a numbered bottle that is sufficiently large to hold the samples for the period required, and the samples are kept in a cabinet or cupboard adjacent to the receiving platform where the milk is weighed. The quantity of the milk received is recorded by weight, in pounds. The samples are taken either by the measure or by the drip system. Some managers prefer the latter system, which is a very satisfactory one, especially in cases where large quantities of milk have to be sampled. Where this method is

adopted a small hole is made in the milk chute between the weigh can and the receiving vat; a vessel is placed underneath to catch the milk as it runs through, and it is from this vessel that the manager takes his samples of milk. By this means a sample of uniform quality and quantity is obtained from the daily intake from individual suppliers. A preservative is used to keep the composite samples in a fit state for testing, bichromate of potash or formalin being the preservatives generally used. The testing is done three times monthly by some companies and four times by others and payments are made monthly. "Babcock" testing outfits are used by almost all dairy concerns for the determination of fat content in milk. There may be a few people who use the "Gerber" machine, but they are very few indeed.

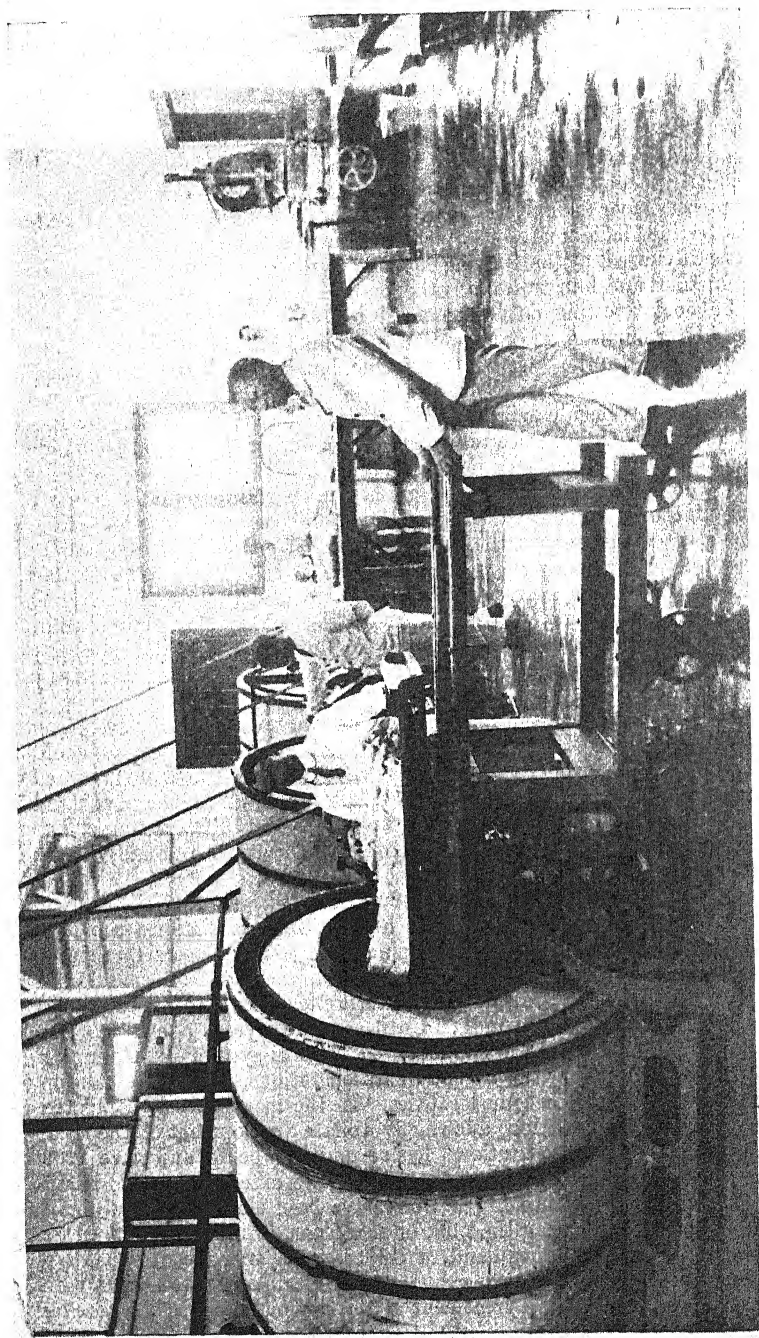
The prices that have been ruling for butter and cheese for some time past have made dairying in New Zealand a very profitable occupation, but the higher price ruling for cheese during this period has made the manufacture of cheese most profitable.

The actual returns depend greatly upon the amount of produce manufactured by individual companies and economy of production, the greater the output the more economical generally is the cost of manufacture. Locality is another factor in the case, because the number of cows carried on a given acreage varies considerably and according to the stock-carrying capacity of the district. Very considerable sums are paid out to dairymen monthly in the flush of the season, especially in the richer district where large herds are carried on comparatively small areas.

The price of land suitable for dairying varies considerably according to its quality and location. Good land suitable for this purpose could be obtained, say, from £20 per acre up to £70 in some of the more favoured sections. Some of the rich drained swamp land in the Auckland district could not be obtained, I suppose, under £100 per acre, but this class of land, if properly managed, will stand exceptionally heavy stocking.

THE CREAMERY SYSTEM.

As in the case of co-operative herd-testing associations, the New Zealand creamery system is very similar in some respects to that of Denmark. All buildings and machinery are erected on sound and up-to-date lines and are sufficient to deal effectively and expeditiously with the daily intake of milk. Until some few years ago it was the general practice for each creamery to have a system of skimming stations according to the extent of its operations, and this condition of things still applies in some localities. In the more sparsely populated and badly roaded districts, due chiefly to late development of the land, a system of "home separation" has sprung into being, and since 1903 has been gradually becoming of considerable extent, with the result that a good many skimming stations have been closed up. No doubt the system of separating the milk on the farms has many points in its favour, yet, on the other hand, if the creamery manager is to have any opportunity to turn out a high grade creamery butter, great care has to be exercised in the treatment of the raw material until the cream



BUTTER-MAKING ROOM, STRATFORD FACTORY.

reaches the creamery. The development of the home separator system in any country should be looked upon with suspicion from the viewpoint of quality, and when it becomes the general practice a strict system of supervision in carrying on the business, coupled with the grading of the cream on delivery to the creamery, is essential if a butter of reasonably high standard quality is to be manufactured.

In 1897 investigations were made by officers of the Dairy Division in the pasteurisation of cream for butter-making, and after experiments had proved the value of this system, the pasteurisation of all cream for butter-making became the general practice throughout the Dominion and has been a great factor in assisting to turn out butter of uniform quality.

The use of pure cultures is generally practised, the starters being developed by the use of commercial cultures, which have proved to be, on the whole, a very reliable medium through which to obtain the necessary lactic acid. Enough starter is used to develop sufficient acid in the cream to enable churning to commence at an early hour on the day following the arrival of the milk or cream at the creamery.

All creameries are fitted up with refrigerating plants, the "Linde," "Hercules," and "Humble & Nicholson" ammonia machines being the most popular, the last being of Victorian manufacture and of a type very suitable for creamery systems.

Creameries are now fitted with combined churns and workers, which have been found to be more economical than the old box churn and butter-worker method. After being worked the butter is packed in oblong boxes of white pine, and lined with a stout vegetable parchment. Each box bears an impress stamp with the brand and registered number of the creamery and the net weight, which, in the case of butter, is always 56 lb., sufficient allowance being made for shrinkage during transit to home markets.

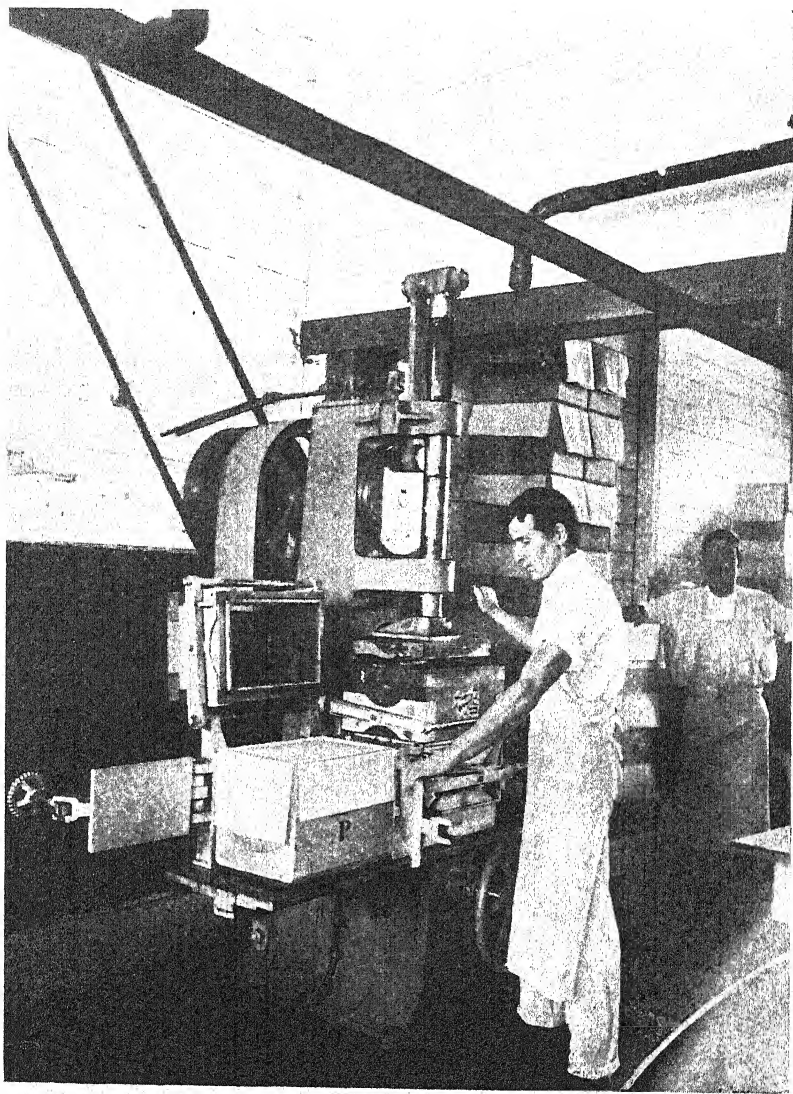
Each creamery is also fitted with insulated chambers for holding the butter in cold air while awaiting delivery to the registered Government cold-store, where it is graded and frozen prior to shipment, and where all butter intended for shipment must be four clear days in the freezing chambers before it can be shipped. All butters are sent forward from the creameries to the cold store without undue loss of time, so that no deterioration of quality may take place before arrival there.

The boxes are marked with the date of manufacture and the number of the churning, so that by this means any faulty churnings can be picked out at the time of grading and stamped separately according to grade, if necessary.

CHEESE FACTORY SYSTEM.

The cheese factory system is similar in some respects to that of Canada, but must not be likened to the cheese factories of this country, where only surplus milk is dealt with.

All milk is delivered to cheese factories by 9.0 a.m. as a rule. Some managers fix an hour, after which no milk can be received. Large jacketed vats, fitted with distributors for steam heating, and



BUTTER-PACKING MACHINE.

having a capacity of from 750 to 900 gallons each, are in general use. Pure lactic cultures and starters are always used for ripening the milk, and the acidity during the course of manufacture is checked by the use of the alkaline solution or acidimeter test. The use of the alkaline test for acidity may be said to have been introduced into New Zealand dairying by Mr. William M. Singleton in 1903, with the result that, to-day, no cheese factory outfit is considered complete unless the necessary requisites for carrying out this test are included.

Many factories are now fitted with mechanical agitators for stirring the curd and the work by this means is carried out effectively and economically. By the use of these machines the method of hand-rake stirring is superseded. The agitators are fitted with cone pulleys, so that the speed can be regulated to a nicety and altered as the condition of the curd changes. Horizontal "gang" presses are in use, and these are so fitted that constant pressure is maintained while the curd is in the press. After being removed from the presses the cheese are kept in the curing room for 14 days and sometimes longer before they are packed for export.

All cheese is forwarded to the Government stores for grading and for cool storage prior to shipment. As in the case of the butter packages, each crate is marked with the factory brand, registered number, net weight, and number of the vat and the date of manufacture. In addition to these each crate bears a shipping number.

VARIETIES OF CHEESE.

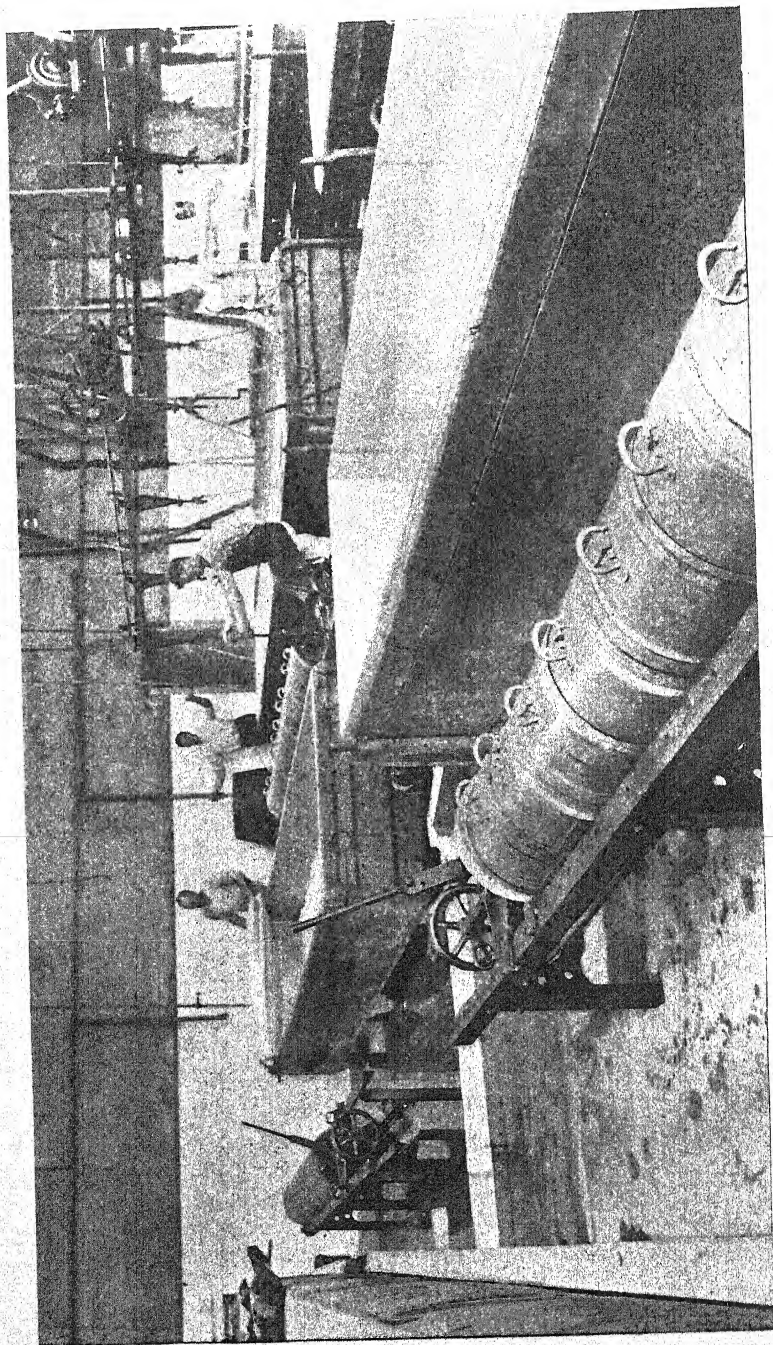
The cheese for export is made upon the "Cheddar" type, on account of it being best adapted to the long period of transport that elapses between the factory and British markets. Another feature that favours this variety is the fact that it is in more general demand than other varieties. The expansion of the export of Cheddar cheese has been very rapid. In 1912 the increase amounted to 494 per cent. over the amount exported in 1902.

A few trial shipments of Stilton, Cheshire, and Caerphilly cheese have been made, but these have been purely of an experimental nature.

The soft variety of cheeses did not receive any attention until a few years ago. There is now growing up a fair local demand, and no doubt as the population of the Dominion increases there will be a growing demand for the various kinds of soft cheese. With the object of affording assistance to those interested, the services of an instructress on the staff of the Dairy Division are always available for those who may require advice or instruction in the making of these varieties.

CHEESE FROM PASTEURISED MILK.

About five years ago experiments were carried out in the Dominion in the manufacture of cheese from pasteurised or heated milk. The results have proved to be encouraging, and the manufacture of cheese along these lines seems to be gradually increasing, particularly in cases where trouble has arisen in regard to ill flavours. Experience has proved that it is possible to make cheese of sound



CHEESE-MAKING ROOM.

and pleasing quality from heated milk, but the details of heating require great care and attention if the best results are to be obtained. Pure starters and regular heating at even temperatures are most essential. If the temperatures rise too high a cooked flavour is discernible, and if the temperature sare irregular or too low foreign flavours result. Cheese well made from pasteurised milk has already found favour with many provision merchants in this country.

WHEY BUTTER.

The manufacture of butter from whey cream has developed very quickly, until it has now become the general practice in cheese factories to skim the whey for this purpose. All whey is separated at a fairly high temperature, about 112 to 116 deg. Fah. before being skimmed. The cream is pasteurised by heating to about 175 deg. Fah., and is then treated along almost the same lines as is the case in the manufacture of creamery butter. It is considered that a cheese factory whose milk supply reaches 2,000 gallons per day can profitably make whey butter. In the early days of its delvelopment the whey butter was retained in New Zealand for home consumption, but gradually the quantity became too great to be dealt with locally, and last year some 240 tons were exported. Owing to this development steps were taken to govern the conditions of export along lines similar to those framed for creamery, dairy, and milled butters, so that now all butter made from whey cream must be branded as such.

MANUFACTURE OF CONDENSED MILK.

The manufacture of condensed milk has been proceeding for a number of years in the Dominion, but the export trade has not developed to any great extent. Condensed milk is a very handy form in which milk can be used in new countries or in districts where milk in its natural form is not available. For this reason no doubt the demand for this commodity in the Dominion has been sufficient for the supply thereof. At the present time some 2,000 cases, each containing 48 tins of 12 oz. net weight, are leaving the country monthly.

MILK POWDER.

The export of milk powder from the Dominion has been going on for some years, but no great development has taken place, which indicates that little attention is being paid to its manufacture even at the present time.

MANUFACTURE OF BY-PRODUCTS.

The by-products of milk have, until the last two or three years, received little attention, and at the present time the manufacture of only casein and sugar of milk may be said to be in its infancy. These industries have developed sufficiently, however, to enable an export trade to commence, and present indications are that the business will expand rapidly in the near future. A great deal will, however, depend upon ruling market values and the output of casein and milk sugar has not, up to the present, been sufficiently large to create a market in this country.

GRADING OF DAIRY PRODUCE.

Situate as New Zealand is so far from the leading markets of the world, some system became necessary, so that control could be maintained over the quality of the produce, and in 1895 the grading of butter and examination of cheese was inaugurated, but it was not until 1900 that the question of grading cheese was seriously considered. At that time Mr. J. A. Ruddick was Dairy Commissioner for New Zealand, and he was responsible, in the first place, for the practice of grading cheese; but it was left to his successor, Mr. J. A. Kinsella, to complete the work. Were it not for the New Zealand grading system several weeks must elapse before the manufacturers would receive any intimation that there was anything wrong with their produce. Under the present system of grading it is not many days before each churning of butter and cheese from each vat of milk is graded, and if there is anything amiss with regard to the quality, those interested are quickly advised of the fact. This method enables steps to be taken to rectify the trouble before its development has reached any considerable extent.

Grading is only one link in the chain of supervision, and goes hand in hand with instruction. The grader detects the faults, and the instructor assists the makers to overcome their difficulties in the details of manufacture. In order that the spirit of the Dairy Act, its amendments and regulations, may be carried out, no dairy produce can be exported unless it has been graded previously.

The grading is carried out at the several registered Government cold stores, through which all butter and cheese must pass before shipment.

The grading is conducted along systematic lines that are thorough in detail. As each parcel is graded, its points of value are recorded, with the addition of the grader's remarks upon the quality. Grading certificates are then made out and forwarded to dairy companies without delay, so that those interested may become acquainted with the quality without loss of time. There are recognised standards of quality for each variety of butter—"creamery," "dairy," "whey," and "milled"—and the same applies to factory and dairy made cheese. After grading, the packages are stamped with the grade mark, according to quality.

A fair average of weights, generally about 5 per cent. of the packages, are checked by the grader and these checked weights are recorded on each grade certificate issued.

The grading department is also responsible for the analysis of butter for moisture content. Surprise samples are taken from time to time, and during the season some thousands are taken and records kept of the moisture content. Assisted by the stringency of the latest amendment to the Dairy Act, regarding the water content of butter, the system of surprise testing is very effective, and affords considerable protection to dealers in New Zealand butters in this country, as far as the legal water content is concerned.

Conferences are held at the different grading stores at various intervals, which are attended, as a rule, by the director of the division, the local instructors, graders, and the managers of the factories and creameries. At these conferences the managers are invited to witness the grading of, and to score the quality of their produce. At the same time discussions are invited upon matters relating to manufacture and grading of individual parcels of either butter or cheese.

TRANSPORT OF DAIRY PRODUCE.

The long sea journey from the Dominion to the United Kingdom necessitates the assistance of refrigeration to ensure the safe carriage of the butter and cheese cargoes.

After a considerable period, during which records of temperature during transit were taken, and close observation was kept upon the condition of the various shipments on arrival at their destination, the most favourable air temperatures suitable for the transport of butter and cheese, and construction of the refrigerating and cold air chambers on board ship were arrived at. The butter is now carried at temperatures ranging between 12 deg. and 15 deg. Fah., and very often in the same chambers as frozen meat; on account of the similarity of the temperatures required for these two commodities this arrangement fits in very well without any adverse influence upon the quality of either. Although some experimentalists have declared that butter held at zero holds its soundness of flavour, and I see no reason to doubt the statement, yet in general practice it is found that the range of temperatures already referred to is quite satisfactory so far as the safe carriage of butter is concerned.

The transport of cheese is a much more difficult subject to deal with than perhaps the majority of people would suppose, owing to its peculiarly sensitive nature, which demands that great care should be taken in the regulation of air temperatures in the cheese chambers. It was only after a considerable period had elapsed and after a great deal of experience had been gained that a satisfactory system was evolved. Experience has taught us that the best condition in which cheese can be carried on long overseas voyages is in cool air chambers with air temperatures ranging between, say, 40 deg. to 50 deg. Fah. It is also important that there should be a constant circulation of air throughout the whole of the various chambers or holds in which the cheese is carried. The best results are obtained if the body temperature of the cheese when shipped is comparatively cool, or about 50 deg. to 60 deg. Fah. When these conditions prevail, cheese is found to carry very well during transit to the United Kingdom.

In the transport of butter and cheese it is essential to the safe carriage of such produce that there should be no great variation in temperatures. Should such instances occur, the quality of the produce invariably suffers to a considerable degree.

CONCLUSION.

In compiling the foregoing matter, the writer has endeavoured to avoid technicalities and statistics as much as possible, and to place before the readers of the Journal a general history of the progress of development of New Zealand dairying in an interesting and, at the same time, instructive manner. The knowledge gained by many years' experience has enabled him to write this article from the standpoint of a practical dairyman, he having been engaged in dairying for the past 25 years, on the farm, in dairy factories, and on the staff of the Dairy Division of the New Zealand Department of Agriculture.

Notwithstanding the rate of progress during past years, it can be confidently expected that the development of dairying in New Zealand will continue for many years to come.

FLUCTUATIONS IN THE FAT CONTENTS OF GENUINE MILK.

By F. J. LLOYD, F.C.S., F.I.C.

It has been known for many years that the milk of an individual cow is liable to strange daily fluctuations in quality or composition. Gradually it has also come to be recognised that the milk yielded by a herd of cows is equally liable to similar fluctuations. The changes in composition of the milk yielded by an individual cow are more or less easily explained. Any cause of excitement or functional disturbance is known to have such an effect. Or a change of food which is not liked by a particular individual, even if appreciated by the herd as a whole, may cause the one animal to restrain from food to an extent sufficient to affect her milk both in quantity and quality.

But these individual fluctuations are to a large extent hidden when we deal with the mixed milk of a whole herd. Therefore, when such mixed milk shows striking changes in composition, as it frequently does, there must be some cause at work which is affecting the major portion of the herd, if not all the animals, in the same way. At the present day this subject is of special importance, because farmers are frequently prosecuted for selling milk as adulterated, simply because it falls below certain arbitrary limits which have been set up by the Board of Agriculture, and are looked upon by many in authority as standards, although they are not standards and were never intended to be. While fully in sympathy with the public authorities in their desire that the public should be supplied with genuine milk, clean and of good quality, yet, as a scientific man, I am most strongly opposed to prosecutions for adulteration when no scientific evidence is brought forward in proof of adulteration. I refer to those prosecutions which are based solely on assumption and, unfortunately, there are far too many such.

Of the conditions which affect individual cows I have already written in a previous volume of this Journal. Some of these conditions, such, for example, as turning them out to grass in the early part of the year, or taking them into the sheds in the early winter would, of course, affect all the animals in a herd more or less. Then again it has been long recognised that the temperature at which cows are kept will greatly affect the quantity and, more especially, the quality of the milk they yield. Thus the well-known fact that the morning's milk is poorer than the evening's is not due solely, as so many think, to the longer interval which elapses between the evening and morning milking. Nor is it explained by the assumption now so much in vogue that the cow having once secreted fat re-absorbs it into her system. A more unscientific theory was never promulgated. Once formed, the cow will not absorb either the milk or any portion thereof. The fact is that the fat is not formed, most probably

because the surplus food, which would have gone to make fat, has been utilised by the cow during the colder night to maintain her body heat. Under ordinary conditions, even were the cows milked at exactly equal intervals the morning's milk would be poorer than the evening's, and the only possible explanation of this fact is that the cause is due to temperature. Under abnormal conditions this may not happen. Thus, on several occasions, the morning's milk in the Milking Trials at the Dairy Show has been richer than the evening's. A very warm day, a crowded hall, and the excitement inseparable from the Show, have reversed the ordinary conditions, while a warm night and the rest and quiet thereof have tended to a richer milk.

It is over twenty years since the effect of temperature on the milk of a herd of cows was first studied by me. Since then, innumerable opportunities of obtaining evidence in connection therewith have presented themselves and have confirmed my original observations.

Thus it has been proved over and over again that in the spring of the year, and again in the autumn, when cold nights and warm days are frequent, the morning's milk has shown a marked poverty as compared with the milk yielded by the same animals under conditions and circumstances alike in all other respects but temperature. Thus temperature is the greatest factor, though not the only one, in bringing about those daily fluctuations in the quality of milk which are so well known to all who have studied the subject.

The daily record of the composition of milk supplied to the British Dairy Institute had conclusively proved that a herd of cows, well fed, carefully managed, and properly milked, could frequently give in the morning milk containing less than 3 per cent. fat. That the uneven hours of milking should cause the morning's milk to be much less rich than the evening's was natural, but what struck one as most remarkable was the irregular composition of the milk, both morning and evening.

In 1914, poor morning's milk was so striking that a report on the percentage of butter fat in milk during April and May was drawn up and presented to the Berks Dairy Farmers' Association on June 6th, 1914. This excellent report is signed "J.M.," and it ought to have been published. Curiously enough in that very same month of June, the cows yielded the poorest morning's milk that has probably ever been recorded. On 12 days out of 21 on which analyses were made, the fat was below 3 per cent., and on several occasions fell to 2.6 per cent.

Again, in April and May of 1915, the milk in the morning fell so frequently below 3 per cent. fat, that I asked the College authorities to supply a record of the temperature for these months. This was kindly done by Dr. H. N. Dickson, President of the Royal Meteorological Society, who also forwarded the records for April and May of 1914.

I had anticipated to find that the low morning's fat would correspond with a low night temperature. I was disappointed. In some cases the two would agree, in many cases they did not. Evidently, then, this was not the main cause.

After carefully tabulating all the available figures for April and May in 1914 and 1915, it appeared probable that the deficiency in fat

was due to a sudden change in temperature rather than to a low temperature. The fall in the temperature from one day to the next morning was therefore calculated and tabulated. It then became evident that if the fall in temperature during the night had been exceptional, it generally affected the quality of the milk. Thus, in April, 1914, on the 20th the temperature fell from 71.8° in the day to 36° on the morning of 21st, and the fat fell from 3 per cent. the preceding morning to 2.6 per cent. Here the low morning temperature might appear to be the cause. But on the 29th, the day temperature was 72.9°, and on the morning of 30th only 45.2°, a drop of 27.7° Fahr., with a consequent fat yield of 2.6 per cent. as compared with 3 per cent. the preceding morning. Here the night temperature was not absolutely low, only relatively to the preceding day temperature, and it appeared to have been the sudden drop in temperature which produced the low fat.

The evening's milk like the morning's is liable to considerable fluctuations, and if the supposition that a sudden change in temperature affects the composition of milk holds good for the morning, it ought equally to hold good for the evening. In this case the change would be a rise in temperature.

Confining my attention in the first place to the figures for April, 1914, the lowest evening fat yield was on 20th, a day when the night temperature had been lower than for some days and the day temperature the highest up to that period; the rise during the day being 35.2° Fahr. The result was striking. The fat in the evening's milk fell to 3.5 per cent., the lowest during the month.

These results induced me to tabulate the figures for all four months and calculate the nightly fall and daily rise in temperature. These tables are given at the end of this paper.

The figures for May, 1914, present some anomalies, as is inevitable, but they also bear out the general conclusion that sudden changes in temperature, whether during the night or during the day, constitute one of the chief factors which produce low fat results. They bring out another important fact, namely, that a warm night is conducive to a high fat content in the morning. The average fat in the morning for the month was 2.8 per cent. On the 15th it rose for the first time over 3 per cent., namely, to 3.1 per cent. The cause appears evident. The night had been warm, the minimum temperature being 53.5°, which was higher than any preceding day in the month. The next three nights were cool, with warm days, and the milk became normal. On the 18th-19th, the night was again warm, after a warm day, and in the morning's milk of 19th the fat rose to 3.2 per cent., the highest for the month. The day was very warm, the temperature rising to 73.8° or 26.9° above the night, and it evidently affected the cows for the evening's milk contained only 3.6 per cent. fat.

The conditions in April, 1915, were very different from those in April, 1914. The morning of the 1st started with a frost, and throughout the month the nights were cool, the highest night temperature being 45.2° Fahr. The day temperature was also low except on the

last three days. The result is that from the 1st to 27th, the morning's milk only twice fell below 3.0 per cent. fat. The third time was on 30th, when a cold night (38° Fahr.) followed a warm day (68.6° Fahr.), so that the drop in temperature was 30.6° Fahr., and the fat 2.8 per cent. Average for month was 3.1 per cent.

The evening's milk fluctuated more than usual. The average for the month was 3.8 per cent. fat. On the 1st and 2nd it was 3.4 and 3.2 per cent. only. As already stated, the 1st started with a temperature of 29.9° and rose to 56.5°, a rise of 26.6° Fahr.; while the 2nd started with a temperature of 32.5°, just above freezing, and rose to 52.6° or 20° Fahr. That this was the cause of these low fats seems evident, for on 28th and 30th, the fat fell to 3.4 per cent. and 3.5 per cent. respectively; as previously stated these were the hottest days in the month. On 28th the temperature rose from 43.1° to 69.9° Fahr., a rise of 26.8°, and on 30th from 38° to 72.8°, a rise of 34.8° Fahr.

In May, 1915, some of the fat yields are not easily accounted for. Others bear out the suggestions already put forward. Thus up to 5th the temperature had been fairly warm both night and day, but on the afternoon of 5th it rose to 73.6°, or 26.6° above the morning, consequently the evening's fat fell from 4 per cent. on 4th to 3.6 on 5th. There was a considerable drop in temperature during the night with a very low fat in the morning's milk. Another very warm day caused the evening's milk to keep low. The next morning the milk was above average, but the day was again very warm and the evening's milk exceptionally poor.

During this month there were evidently other causes at work besides temperature. If one cause only influenced the cows, any changes in composition would invariably follow a definite change in the cause and their explanation would be simple. But we know that there are many causes affecting the milk yield of cows both as regards quantity and quality, and no one cause can be expected either to explain or to fit in with the known facts. This must be borne in mind when studying the appended tables.

It is not necessary to labour these suggestions by quoting further figures.

The last fact which the study of these tabulated results has revealed is the striking manner in which the cows appear to acclimatise themselves to climatic changes. Whether it be cold nights or hot days or an equable temperature, it is only the first change from different conditions which appears to seriously affect the composition of the milk. Occasionally the effect will last for two days, very rarely longer.

These facts conclusively prove how very fallacious an appeal to the cow would be as a proof that milk had not been tampered with.

In putting forward these suggestions, which seem to account for the poverty of the milk so frequently produced in the months of April, May, and June, depending upon the nature of the season, it must not be forgotten that there are other factors which also affect the quality. These facts appear to me worthy of recording, and my suggested explanation can be put to further test against carefully-recorded observations.

| Date. 1914. April. | AIR TEMPERATURE. | | | | FAT IN MILK. | |
|--------------------------|----------------------------|--------------------|--------------------------|------------------------|--------------|-------|
| | Min. Night and Morn. | Max. Afternoon. | Fall during night. | Rise during day. | Morn. | Even. |
| 1 | 37.2 | 64.2 | — | 27.0 | 3.1 | 3.7 |
| 2 | 47.4 | 55.9 | 16.8 | 8.5 | 3.1 | 3.9 |
| 3 | 45.5 | 57.0 | 10.4 | 11.5 | 2.9 | 3.9 |
| 4 | 43.9 | 54.0 | 13.1 | 10.1 | 3.0 | — |
| 5 | 41.2 | 55.0 | 12.8 | 13.8 | — | 4.0 |
| 6 | 44.4 | 56.0 | 10.6 | 11.6 | 3.0 | 4.1 |
| 7 | 38.4 | 49.5 | 17.6 | 11.1 | 3.0 | 3.8 |
| 8 | 32.9 | 52.9 | 16.6 | 20.0 | 3.2 | 3.7 |
| 9 | 34.1 | 51.8 | 18.8 | 17.7 | 3.1 | 3.9 |
| 10 | 44.1 | 57.5 | 7.7 | 13.4 | 3.3 | 3.8 |
| 11 | 41.5 | 59.0 | 16.0 | 17.5 | 3.0 | — |
| 12 | 40.0 | 59.9 | 19.0 | 19.9 | — | 3.8 |
| 13 | 40.0 | 61.5 | 19.9 | 21.5 | 3.0 | 3.6 |
| 14 | 49.8 | 58.8 | 11.7 | 9.0 | 3.0 | 3.8 |
| 15 | 48.0 | 57.2 | 10.8 | 9.2 | 3.0 | 3.8 |
| 16 | 33.1 | 58.4 | 24.1 | 25.3 | 3.3 | 4.1 |
| 17 | 39.3 | 60.0 | 19.1 | 20.7 | 3.0 | 3.7 |
| 18 | 38.1 | 63.9 | 21.9 | 25.8 | 3.0 | — |
| 19 | 36.9 | 66.9 | 27.0 | 30.0 | — | 4.0 |
| 20 | 36.6 | 71.8 | 30.3 | 35.2 | 3.0 | 3.5 |
| 21 | 36.0 | 72.6 | 35.8 | 36.6 | 2.6 | 4.0 |
| 22 | 45.0 | 69.9 | 27.6 | 24.0 | 3.0 | 4.3 |
| 23 | 44.5 | 60.8 | 25.4 | 16.3 | 2.9 | 3.8 |
| 24 | 40.9 | 66.0 | 19.9 | 25.1 | 3.0 | 3.7 |
| 25 | 50.5 | 59.2 | 15.5 | 8.7 | 3.0 | — |
| 26 | 33.0 | 62.0 | 26.2 | 29.0 | — | 3.8 |
| 27 | 36.4 | 65.2 | 25.6 | 28.8 | 3.0 | 3.6 |
| 28 | 41.0 | 68.4 | 24.2 | 27.4 | 3.0 | 3.6 |
| 29 | 43.0 | 72.9 | 25.4 | 29.9 | 3.0 | 3.8 |
| 30 | 45.2 | 51.9 | 27.7 | 6.7 | 2.6 | 4.3 |
| Average .. | 40.8 | 60.6 | — | — | 3.0 | 3.8 |

| Date. | AIR TEMPERATURE. | | | | FAT IN MILK. | |
|-------------|----------------------------|--------------------|--------------------------|------------------------|--------------|-------|
| | Min. Night and Morn. | Max. Afternoon. | Fall during night. | Rise during day. | Morn. | Even. |
| 1914. | | | | | | |
| May. | | | | | | |
| 1 | 38.0 | 50.2 | 13.9 | 12.2 | 2.7 | 4.1 |
| 2 | 33.2 | 57.7 | 17.0 | 24.5 | 2.9 | — |
| 3 | 40.2 | 61.0 | 17.5 | 20.8 | — | 3.8 |
| 4 | 52.0 | 60.5 | 9.0 | 8.5 | 2.7 | 4.0 |
| 5 | 48.1 | 59.0 | 12.4 | 10.9 | 2.6 | 3.8 |
| 6 | 48.9 | 57.3 | 10.1 | 8.4 | 2.7 | 3.9 |
| 7 | 47.2 | 62.4 | 10.1 | 15.2 | 2.6 | 3.9 |
| 8 | 41.9 | 54.9 | 20.5 | 13.0 | 2.9 | 3.6 |
| 9 | 44.0 | 48.9 | 10.9 | 4.9 | 2.9 | — |
| 10 | 36.0 | 55.0 | 12.9 | 19.0 | — | 4.0 |
| 11 | 44.4 | 56.1 | 10.6 | 11.7 | 2.9 | 4.2 |
| 12 | 40.0 | 54.9 | 16.1 | 14.9 | 2.6 | 4.2 |
| 13 | 39.3 | 59.0 | 15.6 | 19.7 | 2.8 | 3.9 |
| 14 | 46.0 | 70.0 | 13.0 | 24.0 | 2.8 | 4.2 |
| 15 | 53.5 | 69.1 | 16.5 | 15.6 | 3.1 | 4.2 |
| 16 | 45.1 | 66.9 | 24.0 | 21.8 | 2.8 | — |
| 17 | 41.1 | 69.0 | 25.8 | 27.9 | — | 4.0 |
| 18 | 40.5 | 73.6 | 28.5 | 33.1 | 2.8 | 4.1 |
| 19 | 46.9 | 73.8 | 26.7 | 26.9 | 3.2 | 3.6 |
| 20 | 46.3 | 76.0 | 27.5 | 20.7 | 2.7 | 3.9 |
| 21 | 48.2 | 74.1 | 27.8 | 25.9 | 2.9 | 4.1 |
| 22 | 46.1 | 78.9 | 28.0 | 32.8 | 3.0 | 4.0 |
| 23 | 55.0 | 66.1 | 23.9 | 11.1 | 2.8 | — |
| 24 | 46.1 | 58.0 | 20.0 | 11.9 | — | 4.0 |
| 25 | 43.0 | 53.1 | 15.0 | 10.1 | 2.9 | 4.3 |
| 26 | 35.0 | 56.0 | 18.1 | 21.0 | 2.9 | 3.8 |
| 27 | 32.2 | 58.1 | 23.8 | 25.9 | 3.0 | 3.7 |
| 28 | 35.2 | 63.1 | 22.9 | 27.9 | 2.7 | 3.8 |
| 29 | 49.0 | 63.9 | 14.1 | 14.9 | 2.8 | 3.6 |
| 30 | 50.0 | 64.5 | 13.9 | 14.5 | 2.8 | — |
| 31 | 46.7 | 67.7 | 17.8 | 21.0 | — | 3.9 |
| Average ... | 42.9 | 62.5 | — | — | 2.8 | 3.9 |

| Date. | AIR TEMPERATURE. | | | | FAT IN MILK. | |
|-------------|----------------------------|--------------------|--------------------------|------------------------|--------------|-------|
| | Min. Night and Morn. | Max. Afternoon. | Fall during night. | Rise during day. | Morn. | Even. |
| 1915. | | | | | | |
| April. | | | | | | |
| 1 | 29.9 | 56.5 | — | 26.6 | 3.0 | 3.4 |
| 2 | 32.5 | 52.6 | 24.0 | 20.1 | 3.0 | 3.2 |
| 3 | 42.9 | 52.1 | 9.7 | 9.2 | 3.0 | — |
| 4 | 44.1 | 58.6 | 8.0 | 14.5 | — | 4.2 |
| 5 | 41.6 | 52.3 | 17.0 | 10.7 | 3.1 | 3.8 |
| 6 | 33.8 | 48.1 | 18.5 | 14.3 | 3.2 | 3.2 |
| 7 | 44.6 | 54.3 | 3.5 | 9.7 | 3.0 | 3.9 |
| 8 | 37.5 | 53.0 | 16.8 | 15.5 | 3.4 | 3.8 |
| 9 | 39.0 | 52.9 | 14.0 | 13.9 | 3.1 | 3.6 |
| 10 | 39.9 | 54.5 | 13.0 | 14.6 | 3.3 | — |
| 11 | 41.6 | 55.8 | 12.9 | 14.2 | — | 3.9 |
| 12 | 42.0 | 50.9 | 13.8 | 8.9 | 3.1 | 4.1 |
| 13 | 39.0 | 50.0 | 11.9 | 11.0 | 3.4 | 4.1 |
| 14 | 32.0 | 55.0 | 18.0 | 23.0 | 3.0 | 3.6 |
| 15 | 36.4 | 58.0 | 18.6 | 21.6 | 3.3 | 3.6 |
| 16 | 37.2 | 62.0 | 20.8 | 24.8 | 3.0 | 3.8 |
| 17 | 38.8 | 54.0 | 23.2 | 15.2 | 3.2 | — |
| 18 | 31.5 | 56.5 | 22.5 | 25.0 | — | 3.8 |
| 19 | 33.4 | 59.4 | 23.1 | 26.0 | 2.9 | 4.3 |
| 20 | 45.2 | 55.5 | 14.2 | 10.3 | 3.0 | 3.7 |
| 21 | 35.0 | 52.9 | 20.5 | 17.9 | 2.7 | 4.0 |
| 22 | 33.1 | 55.0 | 19.8 | 21.9 | 3.0 | 4.3 |
| 23 | 41.8 | 52.1 | 13.2 | 10.3 | 3.2 | 4.2 |
| 24 | 32.0 | 54.0 | 20.1 | 22.0 | 3.1 | — |
| 25 | 36.9 | 50.9 | 17.1 | 14.0 | — | 4.5 |
| 26 | 43.9 | 48.1 | 7.0 | 4.2 | 3.1 | 3.5 |
| 27 | 42.4 | 58.1 | 5.7 | 15.7 | 2.8 | 4.0 |
| 28 | 43.1 | 69.9 | 15.0 | 26.8 | 3.0 | 3.4 |
| 29 | 41.0 | 68.6 | 28.9 | 27.6 | 3.1 | 4.1 |
| 30 | 38.0 | 72.8 | 30.6 | 34.8 | 2.8 | 3.5 |
| Average ... | 38.3 | 55.8 | — | — | 3.1 | 3.8 |

| Date. | AIR TEMPERATURE. | | | | FAT IN MILK. | |
|---------------|----------------------------|--------------------|--------------------------|------------------------|--------------|-------|
| 1915. May. | Min. Night and Morn. | Max. Afternoon. | Fall during night. | Rise during day. | Morn. | Even. |
| 1 | 47.7 | 64.9 | 25.1 | 17.2 | 2.8 | — |
| 2 | 46.0 | 61.8 | 18.9 | 15.8 | — | 4.7 |
| 3 | 38.4 | 55.6 | 23.4 | 17.2 | 2.8 | 4.3 |
| 4 | 43.9 | 61.0 | 11.7 | 17.1 | 3.2 | 4.0 |
| 5 | 47.0 | 73.6 | 14.0 | 26.6 | 3.3 | 3.6 |
| 6 | 49.1 | 76.5 | 24.5 | 27.4 | 2.5 | 3.7 |
| 7 | 49.2 | 76.2 | 26.3 | 27.0 | 3.4 | 3.4 |
| 8 | 51.9 | 73.4 | 24.3 | 21.5 | 3.0 | — |
| 9 | 43.2 | 62.5 | 20.2 | 19.3 | — | 4.5 |
| 10 | 37.4 | 67.1 | 25.1 | 29.7 | 3.2 | 4.5 |
| 11 | 36.3 | 71.0 | 30.8 | 34.7 | 2.8 | 4.3 |
| 12 | 50.8 | 65.4 | 20.2 | 14.6 | 2.7 | 3.9 |
| 13 | 43.6 | 46.4 | 21.8 | 12.8 | 3.2 | 3.9 |
| 14 | 36.6 | 54.1 | 9.8 | 17.5 | 2.9 | 3.9 |
| 15 | 32.8 | 60.5 | 21.3 | 27.7 | 3.0 | — |
| 16 | 42.4 | 63.4 | 18.1 | 21.0 | — | 3.5 |
| 17 | 50.0 | 55.3 | 13.4 | 5.3 | 2.7 | 3.7 |
| 18 | 44.1 | 51.3 | 11.2 | 7.2 | 2.9 | 4.0 |
| 19 | 36.2 | 66.6 | 15.1 | 30.4 | 2.7 | 3.7 |
| 20 | 46.7 | 62.6 | 19.9 | 15.9 | 2.6 | 4.8 |
| 21 | 49.0 | 66.5 | 13.6 | 17.5 | 2.9 | 3.4 |
| 22 | 54.5 | 69.4 | 12.0 | 14.9 | 2.5 | — |
| 23 | 52.1 | 73.5 | 17.3 | 21.4 | — | 4.0 |
| 24 | 50.1 | 74.0 | 23.4 | 24.1 | 3.1 | 4.1 |
| 25 | 46.1 | 76.6 | 28.1 | 30.5 | 3.0 | 4.1 |
| 26 | 48.3 | 77.4 | 28.3 | 29.1 | 3.1 | 3.2 |
| 27 | 46.4 | 61.0 | 21.0 | 14.6 | 2.7 | 4.0 |
| 28 | 46.0 | 60.6 | 15.0 | 14.6 | 3.1 | 3.7 |
| 29 | 38.4 | 60.8 | 22.2 | 22.4 | 3.0 | — |
| 30 | 39.5 | 56.4 | 21.3 | 16.9 | — | 4.0 |
| 31 | 33.8 | 63.9 | 22.6 | 30.1 | 3.2 | 4.2 |
| Average ... | 44.4 | 64.8 | — | — | 2.9 | 4.0 |

MILK PERSECUTIONS—PAST, PRESENT, AND FUTURE.

By EDWARD C. ASH, M.R.A.C., Dallinghoo Hall, Wickham Market.

It is a remarkable fact that the Food and Drugs Act has not had quite the results for which purpose the Act was passed. Unfortunately it has had decidedly opposite effects. The Act has led and is leading, not only to the continual persecution of innocent men, but also is making the sale of whole milk as obtained from the cows an exceedingly risky undertaking, and one certain, sooner or later, to lead to prosecution.

The object of the Act was to ensure that milk should be supplied in the same condition as given by the cows. Mr. Barham stated at the Board of Agriculture Committee in 1901: "The manifest object of the Act is to prevent fraud, and it is clearly never the intention of the legislature to prevent the sale or penalise the sale of an article which though of an inferior quality is nevertheless perfectly genuine." We can therefore be doubly certain that the legislature had certainly no intention whatever of making the sale of peculiarly *rich* milks illegal! and whatever may have been the intention of our legislatures we cannot believe that they either intended to penalise farmers for selling pure milk or wished milk sellers to bring their milk up and down to the standard for their own protection! As it is the farmers supplying pure milk who are prosecuted and milk sellers must, if they wish to keep out of the Police Courts, blend their milks, it is obvious therefore that this law is defeating its own object!

The following pages will show only too clearly that milk prosecutions are a black, and a very black, cloud on British justice, and that unfortunately, a leading science has taken an active part in carrying forward the injustice and hiding the truth. In normal times, when labour is plentiful and feeding stuffs easily obtained, milk prosecutions are little less than a scandal, but at times like the present, when labour is rare and feeding stuffs are difficult to obtain, the matter is even more serious. We are aware that dairy farmers are compelled, owing to the War, to utilise any person, however unsuited that person may be, and so can no longer be quite certain that their cows are properly stripped and that the milk will therefore contain all the fat. As to foodstuffs, the dairy farmer cannot rely on obtaining week by week the same concentrated food, and, we know only too well, cows will not take to a new food at first. Hence, if feeding makes any difference, the change of diet may indirectly have some effect on the quality of the milk.

In fact, whilst the War continues it is merely a question of sufficient inspectors to take samples continually in order to lead to a reign of terror in the dairy world! When we consider the position of the dairy industry under these curious and decidedly strange conditions it is

not to be wondered at that the Act should have been considered as an instrument of oppression and persecution with the object of making Police Courts pay or of preventing dairy farmers from keeping heavy milking cows.

THE PRESUMED STANDARD.

The presumed standard is not the cause of complaint. The dairy industry does *not* wish to reduce the standard, nor is there a wish to supply poor quality milk. Even if the presumed standard were greatly reduced, the working of the Act on similar methods as hitherto would be just as unsatisfactory.

At the present moment, the presumed standard is 3 per cent. fat, and it is not difficult to see that there must be some cause for complaint when we realise that farmers have been prosecuted for selling milk containing even 4 per cent., 5 per cent., and nearly 6 per cent. fat !

Unfortunately, certain persons believe that the continual complaints of dairy farmers as to the shamefully unfair milk prosecutions are made with the object of reducing the standard and thus allowing the sale of poor milk for the sake of increased profits. There is not the slightest truth in this contention, and views of this kind show lamentable ignorance and lack of intelligence.

Let it, however, be clearly stated for the information of the misinformed, that the dairy farmer has no cause of complaint with reference to the presumed standard. For even if the presumed standard were lowered to 2·5 per cent., there would yet be nothing to keep the cows from giving milk below it, and it would only allow milk-blenders to reap a still greater profit.

Therefore, an alteration of the presumed standard would neither be a benefit to the dairy industry nor to the public.

THE COMPOSITION OF MILK.

Milk is a secretion produced from the animal's body, and is not, as some people suppose, the food of a cow changed by the animal into milk. Hence feeding, except under certain conditions, seems to make little, if any, difference to its composition, and even if the food does make a difference the result is achieved in a very indirect and complicated manner. We can therefore say that the importance of food with reference to the quality of a milk is far too slight to be used as a means of increasing the quality of the secretion.

Although the composition of milk varies from time to time, genuine milk has usually under normal conditions the following approximate composition :—

| | |
|-----------------|-------|
| Fat | 3·9 |
| Proteins | 3·5 |
| Lactose | 4·75 |
| Ash | 0·75 |
| Water | 87·10 |

These figures are given by Mr. Droop Richmond as the result of 200,000 analyses, and so can be taken to represent a usual milk.

HOW MILK VARIES.

Apart from variations the causes of which are not yet known or clearly understood and those governed by changes of climatic conditions, there are also certain natural laws which play an important part in the composition of milk. It has been found by countless experiments, as well as by practical experience, that milk usually varies in the following manner :—

- (1) Colostrum.
- (2) Then a period of low fat and normal or high non-fatty solids.
- (3) Then gradually, as the lactation period passes, the non-fatty solids decrease, whilst the fat becomes high.

It has also been found from endless experiments, both in our country and in America, that of the non-fatty solids which usually become less at the end of the lactation period, the milk sugar is usually responsible for the decrease. There are still some who differ from this opinion and who believe that milk in the Northern Counties may vary in a dissimilar manner from that of the rest of England as well as in America. But it is rather curious that, if this were the case, the Leeds University results should not also be dissimilar. We can therefore take it as practically certain that the alterations in the composition of milk which are mentioned above are seemingly usual.

This somewhat definite law of variation would, one might suppose, have been taken into consideration with respect to milk prosecutions!

As to the effect of weather on milk, it has been constantly found that sudden marked climatic changes, such as cold, wet nights, especially when they occur out of season, have seemingly a decided effect on the quality of the milk. Again, a sudden flush of young grass has also a similar effect. Frequently, however, the reason for variation in quality cannot be discovered, for we find that at the Leeds University on August 26th, the milk of a herd of 19 cows fell to below 2 per cent. fat (Report 1901). Although it fell on that day it regained its fat on the next. In reference to the value of food, experiments have given such conflicting evidence that it is quite impossible to form an opinion as to whether feeding makes any noticeable difference in the quality of the milk or not.

SHOW MILK.

It is frequently affirmed that milk produced at a show cannot be considered as evidence of value as to the composition of milk, as the cows, owing to nervousness, produce milks below the standard or otherwise curious in composition. In order to bolster up this theory one hears of cows giving ropy or gargetty milk during the exhibitions. As it is only at shows that the public can notice what the composition of milk actually is, it is not surprising that this theory of "show milk" is promulgated. If it is true that nervousness or fear will produce abnormal milk at a show, it is needless to point out that milks produced on a farm should be continually abnormal or peculiar in composition. Cows are by no means badly treated or terrified at shows and have

comfortable boxes or stalls. Motor-cars do not rush round corners suddenly, nor is it usual for dogs to chase these highly nervous animals round and round the band-stand. Neither do aeroplanes or the air-ships of the enemy deposit bombs at random, bombs which explode with terrific violence. In fact, whilst the cows are continually startled and frightened in the country-side, their visit to the show yard must indeed be a mental rest. Needless to remark, this "show milk" argument is a very simple one and well worthy of those who use it. Do they realise that if milk at the dairy show and other exhibitions does not fairly represent the normal product of the cow, to have milking classes at shows would be simply absurd? Even if show committees could be imagined to be so stupid as to have classes for an abnormal produce of a cow, there would certainly be little honour in winning prizes in such classes. Of course it may be possible that if a cow is fiendishly treated, driven about until wet with perspiration, and tortured to a point of madness, the unfortunate animal may be so affected as to give abnormal milk. The show milk theory would certainly be sounder if the promoters allowed the blame to rest on the music or on the butter-making competition, as bands and expert dairy workers are not common in the country-side, although we are in the twentieth century!

THE BASIS OF MILK PROSECUTIONS.

We can see from the results of the milk trials at various shows that cows continually and frequently give milk below the standard. But even if we were so misguided as to accept the theory of "show milk" we need only turn to the results of a series of investigations carried out by the Leeds University and other institutions on herds of cows treated in the usual manner. If we are so prejudiced as to believe that these results lack value because they are carried out systematically by up-to-date institutions we can turn to the results of the farmers' milking competition held during the Royal Show at Nottingham in 1915, and then we can no longer be blind to the composition of milk. The competition was open to farmers supplying the town of Nottingham, and during a definite period samples were taken of the milk coming into the town, and analysed for their richness and cleanliness. Out of 98 samples of morning's milk, 34 samples failed to reach the 3 per cent. standard of fat and 11 of the evening's failed in solid, not fat. In fact, the total of the 48 samples out of 98 taken would have led to the prosecution of the farmers supposing the samples had been taken in the usual manner. Would even the most difficult to convince consider that farmers competing in classes of this description would add water to their milk in order not to win the prize?

A FEW INVESTIGATIONS.

As there are certain persons only too able to find excuses, and who may attempt, under the cloak of science, to persuade the public that no such results have been obtained, it is necessary to waste the reader's time by giving a few of the various investigations carried out

in order to learn the actual composition of milk. The following are but a few examples of a very large series of experiments carried out during recent times.

LEEDS UNIVERSITY INVESTIGATIONS.

Re QUALITY OF MILK (HERDS OF COWS).

| Report | No. of Cows and Treatment. | Result. |
|--------|--|--|
| 1901. | 19 cows fed on grass and concentrated food. | During 40 days this herd only gave 2.69 per cent. fat, except in some 8 occasions. |
| 1902. | 17 cows, fed on grass and concentrated food. | From May 31st to August 16th, the weekly mean in the morning's milk never reached 3 per cent. fat. |
| 1903. | 18 cows, fed on pasture and concentrated food. | During 39 days out of 52, the morning's milk was never above 3 per cent. fat. |
| 1904. | 20 cows, fed on pasture and concentrated food. | From June 13th to August 22nd, the weekly mean of fat never reached 3 per cent. in morning's milk. |

OFFERTON COLLEGE INVESTIGATIONS.

| Report. | No. of Cows. | Result. |
|---------|---------------|--|
| 1905. | 5 cows | During 3 weeks average percentage of fat was 2.96. |
| „ | 5 cows | During 3 weeks the average percentage of fat was 2.51. |
| „ | 5 cows | During 12 weeks average percentage of fat was 2.97. |
| „ | 5 cows | During 12 weeks average percentage of fat was 2.57. |
| „ | 5 cows | During 84 days the morning milk was 80 times below the standard. |

OFFERTON COLLEGE INVESTIGATIONS.

| | No. of Cows. | Result. |
|---------------|---------------|--|
| Experiment C. | 5 cows | During 84 days the mixed morning's milk was below standard 55 times. |
| „ | 5 cows | During 84 days the milk was below standard 33 times. |

UNIVERSITY COLLEGE, READING.

AGRICULTURAL DEPARTMENT.

| Report. | No. of Cows. | Result. |
|---------|-------------------------|--|
| 9th | 8 cows (Shorthorns) ... | During 42 days the morning's milk was below standard 38 times. |

NEGLECTED EVIDENCE.

We have seen from the previous paragraphs that the milk of herds varies constantly, and we have also seen that genuine milks become low in non-fatty solids and rich in fat towards the end of the lactation period, also that it is usually the milk sugar of these non-fatty solids which has decreased. Let us for example's sake take the following sample of milk containing

| | | | | | | | |
|------------------|-----|-----|-----|-----|-----|-----|------|
| Fat | ... | ... | ... | ... | ... | ... | 3.5 |
| Non-fatty Solids | ... | ... | ... | ... | ... | ... | 8.06 |

As the non-fatty solids are below 8.5 presumed standard this milk would, of course, have led to the prosecution of the farmer for adding water. As, however, we are not County Public Analysts paid out of the rates, let us subject this sample to a more thorough examination, and find the milk sugar, proteins and ash.

AVERAGE COMPOSITION OF MILK.
(Mr. Droop Richmond.)

| | | | | | | | | | | | | | |
|------------|-----|-----|-----|-----|------|--------|----------|-----|-----|-----|-----|-------|-------|
| Proteins | ... | ... | ... | ... | 3.84 | } 8.06 | Proteins | ... | ... | ... | ... | 3.5 | } 9.0 |
| Milk Sugar | ... | ... | ... | ... | 3.41 | | Lactose | ... | ... | ... | ... | 4.75 | |
| Ash | ... | ... | ... | ... | 0.81 | | Ash | ... | ... | ... | ... | 0.75 | |
| | | | | | | | Fat | ... | ... | ... | ... | 3.9 | |
| | | | | | | | Water | ... | ... | ... | ... | 87.10 | |

We see at once that the milk sugar is remarkably low, whilst the proteins and ash are abnormally high. Taking these facts into consideration, and remembering that the fat is also well above the standard, there is every reason to suppose that this milk is actually genuine, for if water had been added to milk of this composition the ash could have been still higher and so likewise the proteins. The above example is given by Mr. Droop Richmond, and shows the importance of finding the milk sugar, proteins and ash in the so-called adulterated samples.

We have seen that milks frequently become low in milk sugar and rich in fat at the end of the lactation period; we can therefore presume that this milk was the produce of a herd in such a condition.

Now let us take the following case. A farmer's herd consisted of 12 cows, the majority of which were approaching the end of their lactation period. The farmer was unable to supply the quantity he had contracted for, and his client continually wrote asking for more milk. Yet day by day the decrease in the quantity continued until it was 17 gallons per day.

Referring to the above conditions we would have little hesitation in affirming that the composition of this milk would be somewhat similar to the composition of the milk given by Mr. Droop Richmond. That is to say, it would be rich in fat and low in non-fatty solids, and of the non-fatty solids the milk sugar would be the one reduced in quantity. The farmer had a sample taken and he was summoned on the following composition:—

| | | | | | | | |
|----------|-----|-----|-----|-----|-----|-----|------|
| Fat | ... | ... | ... | ... | ... | ... | 3.55 |
| N. F. S. | ... | ... | ... | ... | ... | ... | 7.09 |

He was accused of adding 16.59 per cent. water, and yet this milk was seemingly a milk genuine but abnormal in composition. Another analyst found that the proteins were high, ash quite normal, whilst the *milk sugar was remarkably low*. The farmer was fined £10!

In another case a farmer under precisely similar conditions was summoned on a milk which contained—

| | | | | | | |
|--------------|-----|-----|-----|-----|-----|---------------|
| Fat | ... | ... | ... | ... | ... | 5.3 per cent. |
| Other solids | ... | ... | ... | ... | ... | 7.7 |

and was accused of adding 9.18 per cent. water. In this case it is interesting to note that the farmer was warned several times by the firm he was supplying that the milk was below the standard. As, however, he was unable to break his contract he could but continue to supply the milk, and as he was not allowed to add anything to his milk he was compelled to supply it whatever might be its composition. Needless to remark, when this milk was more thoroughly examined by another analyst the milk sugar was found to be remarkably low, whilst the proteins and ash were normal.

These are but two examples of many, but they only too clearly show the "justice" of the present milk prosecutions. For there we have two examples of milks typically pure—milks which are abnormally rich in fat, and milks which, if properly analysed, would have proved to anyone who understood the composition of the product that they were pure. Unfortunately this procedure, faulty, slipshod and unreliable as it is, is not the fault of the particular analysts whose certificates led to the subsequent prosecutions.

When thieves are caught seizing property not their own, the law goes so carefully that it even makes the owner of the property swear that it belongs to him, yet in milk prosecutions the evidence used in the prosecution of the farmer is absolutely valueless, and evidence which might show whether the milk were pure or not is taken into no account!

It seems surprising that scientific men are agreeable to sign their names to an accusation of fraud on worthless or trivial evidence, and it seems still more surprising when one remembers that these chemists are perfectly aware that their opinion will lead to the prosecution and nearly as certainly the conviction of the unfortunate farmer!

WORDING OF THE ANALYST'S REPORT.

Whatever may be our opinion from the above paragraphs, we must yet consider that county public analysts are men of deep learning and men of undoubted integrity. And yet we find that in some

districts milks below the presumed standard in fat are actually certified in the most curious manner. The sample we are taking contained 2·7 per cent. fat, and the chemist signed his name to the following declaration :—

“ Milk of the lowest quality, 92 parts.

“ Milk entirely devoid of fat, 8 parts.

“ Observation : The sample contains 2·76 per cent. of milk fat, standard being 3 per cent. of milk fat.”

If this is true, if this milk was composed as the chemist would lead us to believe, how is this milk entirely devoid of fat obtained. There is no separator even in the most up-to-date dairy, even if there is such a separator in the world, able to produce milk entirely devoid of fat. Presuming, however, that this wording is allowable for describing a milk containing 2·7 per cent. fat purchased from a farmer, it must be similarly accurate of milks below the standard which have been produced at shows. Would it be rude to ask one of these Public County Analysts who used the above method of describing milks what the substance produced by “ Red Daisy,” a cow exhibited by His Majesty the King at the Royal Show in 1914, could be? This cow gave from all appearances most excellent milk, but it was below the standard, and only contained 2·38 per cent. fat. As we have seen that a milk containing 2·7 per cent. fat is composed of 92 parts of lowest quality milk and 8 parts entirely devoid of fat, it seems somewhat difficult to understand what the milk containing 2·38 per cent. could possibly be. For we can hardly suppose a milk to be below the lowest quality, nor a milk to contain less than no fat! Perhaps we are wrong. Wording of this type can only have one result, and that is to mislead both the magistrates and the public, and lead them to believe that the milk is absolutely worthless. As this wording is the signed opinion of a learned man it naturally carries weight.

On December 29th, 1914, Mr. P. B. Kent, Secretary of the Farmers' Protection Society, brought the unjust wording used by the analyst to the notice of Lord Lucas, then President of the Board of Agriculture. Needless to remark, the Board of Agriculture were kind enough to reply that they had received the letter and were giving the matter their attention. The previous year, at the Royal Show, Lord Lucas had exhibited a cow, “ Lilac,” which only gave 2·7 per cent. of fat. Strange, but true!

THE POSITION OF THE PUBLIC ANALYST.

The public analyst, is expected under the Food and Drugs Act, to calculate added water on the quantity of fat or non-fatty solids found. He is not expected to make further investigations as to the possible purity of the milk, and certain chemists believe that they must certify a milk to be adulterated however obviously it may show its purity. We can but believe that the public analysts are up-to-date in the science they represent, and if this is true, they must be perfectly well aware that by carrying out the regulations they are continually certifying pure milk as adulterated! That they should be agreeable to calculate added

water on such worthless evidence is somewhat surprising, the more so when they actually append their names to these opinions.

If public analysts had refused to sign their names to anything but the *absolute truth*, no Government in the world could have compelled them to do otherwise. To sign their names to "what they had actually found" would, we might suppose, be the only thing a man who views science and honour in the proper light could do.

There does not seem anything in the given form of certificate in the 1875 Act to compel these public analysts to use words implying added water or the entire absence of fat and low quality, &c., but at the same time we can hardly believe that public analysts would actually go the length of using words of this kind in order to lead to the conviction of the defendants or to persuade the public that the milk which had been supplied to them was of a peculiarly low quality. It would have been thought that men placed in such a position as public analysts—practically officials—would be given their laboratories and equipment and a definite remuneration a year, so that it would be no advantage to them to certify adulteration or have samples taken. At the present moment the public analyst seems to be placed in the position of a business man—the more samples taken, the more he analyses, the more profit he makes!

THE RESULT ON THE DAIRY INDUSTRY.

As farmers have naturally no desire to appear in the police courts, amongst drunkards and disorderlies, they are gradually learning that the keeping of cows is decidedly risky and hardly worth it. Hence, many farmers have fattened off their herds, and others, who have suitable farms, think it wiser not to keep cows. We see the results in the decline in the number of cows kept to-day. If this senseless prosecution continues it is certain that the number of cows kept will become more and more reduced and the beef supply of the future will be adversely affected. If dairy farmers were allowed to add something to their milk in order to bring it up to the presumed standard, their position, difficult as it even then would be, would certainly not be quite so hopeless as it is now. The farmer is compelled to keep to his contract, and to continue to send his milk whatever may be its composition. Even if he knows that his milk is below the standard he must continue to send it with the knowledge that he will eventually appear in the police courts, and undoubtedly be convicted. Then, to make the farmer's position still more difficult, the dairyman who bought the milk may take proceedings against the farmer for damages to his own business by the supply of "adulterated" milk. This is realised by some of the smaller dairymen, and a few months ago a dairyman brought an action against a farmer who had been convicted and fined £10 because his milk was low in fat! By this means the dairyman "recovered" over £60 damages! When we remember that very possibly the milk was perfectly pure, the serious position of the dairy farmers is quite clear! Although very few milk firms take advantage of their position, yet it is obvious that they hold the farmer

in the palms of their hands, and those (fortunately at the present few) who have little scruples need only wait for a suitable opportunity to make considerable sums out of the farmer supplying them with milk. Under these conditions it is quite impossible for farmers to continue the keeping of cows and the selling of milk, and the more the position is realised the more serious will naturally be the effect on the milk producing industry. The farmer also knows only too well what a small part justice plays in these proceedings, and it is not surprising, therefore, that they are advised by their solicitors to plead guilty, and to give any excuse, however untrue, for the composition of their milk. We hear of farmers pleading that they had left water in their churns after washing them, or finding some other excuse, with the object of preventing the heavier fine which might be incurred if they stood up for their own innocence.

THE FUTURE MILK PROSECUTIONS.

The Milk and Dairy Act of 1915 will, it is feared, make matters far more serious for the cow-keeper than they are already. After a sample of milk has been taken and found below the standard, the dairy farmer has, what seems on the surface a remarkably easy way of proving his innocence. He may apply that a sample should be taken by an inspector the following morning directly from the cows. This, as already pointed out, would seem an excellent way of proving his innocence! But we have seen from a previous paragraph that milk varies considerably even in twenty-four hours, and that this variation may be extensive. Hence, when the inspector presents himself, and takes a sample of the milk which has been found below the standard the previous day, that milk when analysed may certainly be well above the standard! Then the position of the farmer will be even more serious than it is to-day! For there will now seem to be an actual proof that this farmer had adulterated his milk, although, as a matter of fact, this evidence proves nothing. This Act, coupled with the methods of analysis in the present time, seemingly will be the death knell of the dairy industry. The prosecutions will, more certainly than ever, if this can be possible, lead to convictions, and the inspector-sampling-method will lead the magistrates to believe that the farmer is actually an adulterator. Hence we can rest assured that the penalties will be far more severe than they are to-day, the magistrates feeling no longer that there is grave doubt as to the guilt of the defendant. Again, this Act, with reference to the diseases of cows and the bacteriological contents of the milk, means additional serious troubles for the cow-keeper. If veterinaries really were experts in bacteriology the matter could again be simpler, but veterinary experts in this branch of science are not too common.

A PLEA FOR JUSTICE.

When milk is found to be below the presumed standard in non-fatty solids, dairy farmers cannot be blamed for demanding that this milk should be examined carefully for further evidence before they

are accused of adding water—that is to say, that the samples should be analysed for milk sugar, proteins, and ash, and that the quantities of these should be notified on the chemist's certificate. Again, dairy farmers have every right to demand that the various conditions, such as the lactation period of their cows and the climatic conditions about the time the sample was taken, should also be considered. The using of mere superficial words of no legal value, and only liable to bias the magistrates against the farmer, is another point which the dairy farming industry should take well in hand. If these words are chosen by the public analyst, perhaps legal proceedings against these persons would teach them that to sign statements which are valueless and even incorrect cannot be undertaken with impunity even when dealing with the agricultural community. If these curious forms of words already complained of are the result of the Act and not the result of the chemist's own choosing, pressure should be exerted until this insult and injustice is removed.

Farmers have no wish to protect rogues who actually adulterate their milk, nor have they any wish to supply the public with milk of low quality. The dairy industry has every reason to expect that the results of various investigations carried out all over the world should be clearly understood by those whose duty lies in the working of the Act, and that the result of these experiments should be taken into proper account when they are accused of adulteration. If there is any reason why British farmers and dairymen should not be treated in the usual British manner the reason for so curious a position should certainly be brought to their notice.

The Milk and Dairy Act of 1914 is, as we have already noticed, likely to make matters worse, but if the question is dealt with in the proper way by men who understand something of farming and milk producing conditions, it is quite possible that the public might be protected from adulteration without injuring in any way the Dairy industry.

There is certainly every reason for drastic alterations when we realise that for many years hundreds of farmers have been summonsed, convicted and disgraced for the "crime" of supplying pure milk; and that the purveyors who are able to mix milks must safeguard themselves by the blending of the produce. It is difficult to see in what way that Act has benefited the public, for instead of leading to rich milks it has led to a constant reduction in quality. For the working of this Act both the chemists and inspectors are paid out of the public money, and so the ratepayers have every right to demand that their money is no longer wasted in this manner.

As to the Government and the Board of Agriculture, the public will also judge their responsibility. Unfortunately, the Government and the Board of Agriculture are only too agreeable to wax hot and excited over trivial and unimportant matters, whilst matters which are of serious importance to the community are frequently treated with scant notice.

But let the public remember one thing—that even if hundreds and thousands of farmers, convicted and disgraced although innocent, are of little importance, the continuance of this policy can only have one result—*less cows, less milk.*

CONCLUSIONS.

(1) The present system of analyses is obviously highly unsatisfactory, inasmuch as pure and adulterated milks give similar results.

(2) The milk sugar, proteins and ash would, if found, in many cases, show whether the milk were adulterated or pure. In some cases the abnormal quantity of one or more of the non-fatty solids leave little doubt as to the purity of the sample, whilst a reduction in all the constituents would give more satisfactory evidence of adulteration. It does not really matter whether the reduction is in lactose or proteins, as it is obvious that one cannot add water to a mixture without reducing each component part to the same extent.

(3) The present method of testing samples by specific gravity, in order to divide the up-to-standard milks from those below standard, is highly unsatisfactory. Toned milks, cleverly adulterated milks, naturally pass, unless their appearance leads to suspicion, whilst genuine milks below the standard are “analysed” and lead to persecutions.

(4) At the present stage of Dairy Chemistry research, the system of dividing the above and below standard milks would be less unsatisfactory if it were not for—

- (a) The wording of the chemists' certificates.
- (b) The wish of the prosecution to obtain a conviction.
- (c) The general view held by magistrates that milk below the presumed standard is illegal.
- (d) The treating of these milk inquiry cases as Police Court cases.

(5) Certain well-known analysts believe that the Refractometer is the most satisfactory method of detecting water.

(6) As the present milk prosecutions lead to the prosecution of innocent men and somewhat protect rogues, it is obviously of national importance that research should be carried out with the purpose of discovering—

- (a) The composition of milk under varied conditions.
- (b) The effect of the lactation period on milk.
- (c) The effect of feeding on milk.
- (d) The use of the Refractometer or any other method for discovering added water

For the sake of justice and for the protection of the British Dairying Industry an extensive research on the above points is seemingly badly needed.

THE WORLD'S PROGRESS IN DAIRYING, 1915.

Reviewed by C. W. WALKER-TISDALE, Northallerton.

THROUGH most of the great nations being engaged in war, it necessarily follows that progress in most industries, apart from those engaged in munitions produced for destructive purposes, is arrested, and very little investigation work can be undertaken.

As a result of this we have to look chiefly for reports on progress in dairying to countries other than those engaged in the war, though for the period of review, namely, the year 1915, a fair amount of important investigation work in this country has been reported upon. This work must necessarily, however, become more and more curtailed as the war goes on and the more serious aspect of the position is realised.

Naturally at a time like this new investigations to be of national importance should be confined to matters directly affecting the economic situation, and to some extent the hygienic aspect also.

Many such investigations were in progress at the outbreak of war, and are being continued to the nation's advantage. They indicate the means of producing the maximum amount of produce at the lowest cost if only they can be put into practice under all the difficulties which the war has created.

I.—MILK HYGIENICS.

NATIONAL CLEAN MILK SOCIETY.

A "National Clean Milk Society" has recently been formed with the objects of raising the hygienic standard of milk and milk products, and educating the public in the importance of a clean and wholesome milk supply. This admirable propaganda movement is well supported by leading medical and other authorities, and the work will embrace efforts to improve the conditions at dairy farms, in railway transport, and at milk shops, in addition to the methods of distribution to consumers' houses and the care of milk in the home. The excellent example set by American (United States) cities in the control of the milk supply so that the public may secure the purest of milk, or the so-called "certified" milk containing less than 10,000 germs per cubic centimetre, is to be advocated. Farmers will be initiated into the ways of producing and marketing such milk for which provisions are made in the New Milk Act, whilst the public will be educated into differentiating between various grades of milk—good, bad, and indifferent.

A bulletin on the lines of the American Score Card system, as applied to the inspection of dairy homesteads, is issued by the National Clean Milk Society.

Publications of the National Clean Milk Society. Chairman, Mr. Wilfred Buckley, Moundsmere Manor, Basingstoke.

The preliminary step of drawing up the instructions to the farm inspector, and the issue of same in an attractive little pamphlet, is very promising, and probably as the society's movements become directed through the channels selected for its work, they will exercise a healthy and stimulating influence upon the production of good wholesome milk.

We await with interest news of the development of the movement, and wish it every success.

MILK TRANSPORT.

Some interesting experiments have been made by the American Agricultural Departments to test the resistance of milk under certain circumstances to the temperature of the air surrounding it.

Obviously if the initial temperature of milk when cooled is low this is the main point, but it is proved that the after circumstances are equally important.

The temperature of milk easily rises to that of the surroundings, and the tests showed most emphatically that any method of protecting the milk in the churns, such as by jacketting or covering the churns, was effective in keeping the temperature from rising in the heat of summer.

Milk churns left standing in the sun on road or rail are obviously open to all the effects of warmth engendered by the situation, and the objects of the original cooling are rapidly nullified.

EXPANSION OF MILK WITH VARYING TEMPERATURE.

An interesting study in the expansion of milk and cream was carried out by the United States Department of Commerce in 1914 and reported upon during the past year. From a strictly accurate point of view the results were badly affected by both the chemical and physical condition of the samples apart from the testing temperature, but for commercial purposes the investigation is interesting as it bears upon the disputes in measure which occur when farmers put warm milk on rail for a long journey and are dissatisfied when complaints are received of short measure.

Under extreme conditions of a considerable reduction of temperature between the time when the warm milk is measured into a railway churn and when it arrives after a cold journey at the wholesale depot, the shrinkage in volume is very noticeable and high in proportion.

II.—MILK ECONOMICS.

SCARCITY OF MILCH COWS AND THE WORK OF MILK RECORD SOCIETIES.

One serious feature of the present situation lies in the fact that in addition to the price of milch cows having risen considerably they are becoming increasingly difficult to obtain.

The demand for large quantities of milk at condensing factories, military camps, and hospitals has diverted the supplies from public consumption. Added to this, the high price of meat leading to the slaughter of innumerable cows, the shortage of labour in stock rearing

and the tendency for grass farmers to buy cows in milk and dispose of them so soon as dry, has had a steady and cumulative effect in reducing stocks.

Under such circumstances milk record societies are severely handicapped in their efforts to create a live interest in the conservance of selected animals and their reproduction as desirable individuals of the species.

One of the great difficulties in the past with regard to the extension of milk record societies has been the growing tendency for milk producers to dispose of the young stock and keep the milch cows one season only when they are purchased by a dealer who sells them at calving in another district.

To such milk producers the milk record has no attractions, though strangely enough, some of them attempt to raise their calves but with no intention of keeping them to come into the herd.

It is often the men with more capital who are far-sighted enough to see the value of registering the records of their cows and saving the produce of the best.

The slaughter of Animals Order of 1915 regulating the sale and disposal of calves must have proved to be a considerable help to the desired end in conserving the young stock.

MILK RECORDS.

In relation to the recording of milk yields, the Report on Milk Records in Berks and Bucks for 1913 and 1914 has been published by the University College of Reading as Bulletin XXV, and gives the details in yield of no less than 39 herds, comprising 1,923 cows.

The information given affords a most interesting insight into the factors of value in considering individual milk yields.

Additional tables of average yields, of the make-up of herds in relation to the various ages of the cows, and also analyses of calvings, are equally admirable features of the work under this authority.

A register of heavy milking cows is also published, and adds much to the general value of the whole scheme.

The average production per cow of the 39 herds was 661 gallons. The best herd averaged 846 gallons, and the worst 535 gallons per cow.

Of 1,277 cows recorded as completing their lactation period, or 42 weeks in the herd, the following analysis shows that—

| | | |
|--------------------|------------|-------------------------------------|
| 193 cows or 15.11% | gave below | 5,000 lbs. milk. |
| 810 " " | 63.43% | from 5,000 to 8,000 lbs. milk. |
| 227 " " | 17.78% | between 8,000 and 10,000 lbs. milk. |
| 47 " " | 3.68% | over 10,000 lbs. milk. |

The highest individual yield was 15,718 lbs. milk in 47 weeks.

A report on the cost of food in the production of the milk is to be issued as a separate bulletin.

It is pointed out in the report that it is desirable to have a large proportion of a milking herd calving between October and January for the reason that autumn calves will give from 100 to 150 gallons more milk than those calving in early summer. This is a fact well known to many dairy farmers, but not to the majority of cowkeepers.

COST OF FOOD IN PRODUCTION OF MILK.

The fourth report of the South Eastern Agricultural College for the year ending May 1st, 1915, gives further valuable figures in connection with the production and cost of milk.

The period covered in the report is not much influenced by war prices, as most of the farmers had contracted for their foodstuffs before the heavy increase in prices became general.

The *summer period* of 26 weeks, May 1st to November 1st, 1914, showed that 617 cows produced milk at an average cost of 3·75 pence for food per gallon, the yield being 2·16 gallons daily per cow, and cost of food per cow per day 8·10 pence.

The cheapest cost of food per gallon was shown to be 2·16 pence and the greatest 7·58 pence.

The cause of low cost of production is mainly on account of the very cheap grass, and it is this factor in all cases that chiefly influences the summer cost of production.

A drought causing shortage of grass may make a difference of nearly 1½d. per gallon in the cost of summer milk.

The *winter period* of 26 weeks, from 1st November, 1914, to May 1st, 1915, showed that the average of 619 cows produced milk at an average cost of 5·84 pence for food per gallon, the yield being 2·14 gallons, and the cost of food per cow per day 12·5 pence.

The cheapest cost of food per gallon was 4·64 pence, and the greatest 8·18 pence.

The results for the *full period of 12 months* showed that 547 cows produced milk at an average cost of food per gallon of 4·76 pence, the daily yield being 2·14 gallons per cow, and the cost of food per cow per day 9·78 pence.

Summary of Three Years' Results.

The herds visited averaged 656 gallons, the highest average being 781, and the lowest 489 gallons. They are summarised as follows:—

| | | | | | |
|--|---|---|---|------------|------------------|
| 6 herds averaged over 750 gallons per cow. | | | | | |
| 9 | „ | „ | „ | 700 to 750 | gallons per cow. |
| 15 | „ | „ | „ | 650 to 700 | „ „ |
| 15 | „ | „ | „ | 600 to 650 | „ „ |
| 7 | „ | „ | „ | under 600 | „ „ |

Recommendations for the economical production of milk of particular importance include the selection of the best individual cows through the mediums of breeding and milk recording, the careful estimation of yield of milk in comparison with cost of food and the allotment of rations according to the varying yield of milk from individual animals. Of course careful feeding to avoid waste is covered by such precautions.

Home-grown food, but no excess of long hay and roots, is advised, and lastly the intelligent interest of the man in whose charge the cows are placed is a factor essential to the best results.

MILKING MACHINES.

The severe labour difficulties with which farmers have recently been faced and the growing difficulties in this direction have led to a very great amount of attention being devoted to the subject of milking machines, and it is likely that now, if ever, milking machines will be so improved as to solve most of the difficulties which have previously prevented their general adoption.

We have always looked to foreign countries previously for the lead in the construction and manufacture of milking machines, but the demand for machines by English farmers is likely to concentrate the attention of our manufacturers on the subject.

A paper read before the British Association of Science at Melbourne reviews the results of investigation into the use of milking machines.

It is pointed out that in previous tests the chief difficulty has been the impossibility of obtaining best results unless the machine is scrupulously cleaned, for whilst the dairy worker knows the importance of cleanliness which has been engrained in him by generations of practice, it is the cowman, who, being responsible for the use of the milking machine, commonly fails to realise this most important essential, which often results in much trouble.

That no machine at present in use will strip the cow is commented on as an advantage, inasmuch as the stripping and massage of the udder during this operation by hand prevents atrophy. By this argument it would appear to be admitted that the machine, even if capable of stripping would tend of itself to deteriorate the power of the cow as a producer of milk in large quantities.

The paper reviews the comparative value of different metals in the composition of teat cups, especially as regards resistance to rust and consequent freedom from septic material.

Aluminium appears to corrode rapidly, and it is questionable if it is the most suitable for the purpose. Light gun-metal or brass cups, nickel-plated, appear to stand better.

In connection with the sanitary aspect, it is shown that, provided proper means are taken to thoroughly clean the machines, milk with a low bacterial count can be obtained.

It is generally assumed that if milk is obtained containing less than 10,000 germs per cubic centimetre such milk is of first-class or "certified" quality, and this, it has been proved, can be secured by the use of milking machines.

In the experiment, as compared with an average of 7,500 bacteria per cubic centimetre in milk drawn by hand, the machine-drawn milk contained 6,750 bacteria.

On 25 occasions the hand-drawn milk contained at least twice the number of bacteria present in the machine-drawn milk, whilst on 12 days the machine-drawn showed at least double the number contained in the hand-drawn.

The report is extremely interesting, but can only be considered in the nature of an experimental test.

"Milking Machines in Victoria." By B. T. Archer in the Journal of the Department of Agriculture, Victoria. January, 1915.

PRODUCTION OF CHEESE.

This is recommended by the Board of Agriculture in the October Journal because of prevailing high prices and as a contribution towards the national food supply.

The arguments used are favouring of cheesemaking during the season (early summer) when there is a surplus production of milk in excess of that required by the public for direct consumption, and that this may best be undertaken at a co-operative depot.

The manufacture of butter is pointed out as being wasteful, as butter substitutes are more economical and quite wholesome, and that the extraction of butter from milk takes less than half the food substance of the milk. Also that cheesemaking is more profitable than the manufacture of butter.

Calf rearing upon a milk diet is also decried as there are satisfactory substitutes.

Some further details are given as to the choice of kind of cheese to make.

This encouragement of cheesemaking as applied to the farmer is not generally desirable, as the demand for milk in these days and the high price obtainable rather tends to milk selling, and rightly so when supplies to the public are dropping owing to the scarcity of labour.

On the other hand, if it encourages the raising of milch stock by indicating what may be done with surplus milk, it has an economic value, though under all the circumstances there does not appear to be any great direct economic advantage.

CHEESE FROM HEATED MILK.

A continuation of these experiments at the British Dairy Institute is recorded, the investigation having been undertaken in order to determine the effect of keeping milk at the pasteurizing temperature for 15 or 30 minutes in the closed machine instead of cooling it immediately.

The experimental cheese were each made from 200 lbs. of milk and run in sets of four.

- (1) The control cheese.
- (2) Milk heated and cooled immediately.
- (3) Milk heated and kept hot 15 minutes before cooling.
- (4) Milk heated and kept hot 30 "

The heating varied from 140° to 200° F., and no special difficulty in coagulation was met where the milk was raised as high as 190° F. with the immediately cooled milk, or 170° F. with milk kept hot. Above these temperatures more rennet was required and the curd obtained was weak in character.

Starter was added in rather larger proportions than usual. Bacteriological examinations showed that in the case of milk heated and cooled immediately no effective reduction in the bacterial contents

was obtained below a temperature of 170° F. At this temperature the number was reduced to one-fiftieth of the total. At 180° F. to one-eighty-eighth of the total, and at 190° to 200° F. to practically nil.

When the milk was retained for 15 minutes at 150° F. the diminution of the bacteria was greater than when it was heated to 170° F. and cooled immediately. When retained at 170° to 200° F. for 15 minutes the bacterial contents was reduced to practically nil.

The resulting cheese examined after four months showed that many were not typical Cheddar cheese, but blue-veined cheese of excellent flavour and quality, the heating probably accounting for loss of elasticity of the curd and consequent production of less dense cheese favourable to the development of mould.

If typical Cheddar be required the milk should not be heated above 190° F. if cooled immediately, or beyond 160° to 170° F. if kept hot for 15 or 30 minutes.

Chemical analyses showed the cheese from the heated milk to contain more moisture and rather less fat.

FEEDING CAKE.

The introduction of palm-nut and ground-nut cakes has received an impetus from the high prices ruling and the diversion of the raw material from Continental markets.

A general scarcity of hay in many districts and the demands of the military upon stocks where available has also helped in this effect.

Feeding of concentrated foodstuffs has increased generally, and we may safely assume that milk production will claim increasing quantities of the bye-products of corn mills, oil mills, and breweries.

From the report published in June, 1915, of the "Experiments in the Feeding of Dairy Cows" by the Armstrong College, Newcastle-on-Tyne, extending over three years, we learn that it is claimed substantial evidence was noted showing that palm-nut cake gives a higher percentage of fat in the milk as compared with Bombay cotton cake, which shows a similar chemical analysis.

RECENT APPLICATIONS OF BACTERIOLOGY TO DAIRYING.

This review traces the encouragement by the dairyman of fermentation in the manufacture of milk products from the time it was recognised the bearing such practices had upon the resultant work up to the deliberate pasteurization of milk prior to inoculation of recognised and selected ferments.

Then follows a detailed review of investigation into the purity of Bulgarian Maya or Yogurt preparation and the therapeutical value of such fermented milk.

Investigations made into ferments for ripening cream indicate that further selection in procuring a purer "Starter," more thorough

Official Bulletin No. 5. Newcastle-upon-Tyne. June, 1915.

Dr. Giuseppe Fascetti in the Monthly Bulletin No. 2. February, 1915.

International Institute of Agriculture.

washing of the butter grains and immediate cold storage are the lines upon which the improvement of quality in butter must be sought.

It is also worth noting that a 24-hour ripening of the cream before churning beyond the usual 18 hours in the creamery, or a total of 42 hours, is more favourable to the production of a full aroma in the butter.

Applied to cheesemaking, investigations have been mostly in the direction of the testing of the efficacy of well-prepared starters in the making of certain types of cheese, notably the Reggio-Grana cheese, an Italian product that seems much akin to the Swiss Emmenthaler, which is better known as Gruyère cheese in this country. The starters for Dutch Edam and Gouda cheeses were also experimented upon. Whey is the medium used for the preparation of these starters.

A very successful method is described of making Brie and Camembert cheese from milk pasteurized at a temperature of 65° C. (149° F.) and subsequently refrigerated, after which three specific ferment cultures are added. No particular change in the method of making is advocated, but the preliminary practices here stated were promptly adopted by two large cheese factories so soon as satisfactory demonstrations were made.

The difficulties still in the way of regular work in cheesemaking from pasteurized milk are still many, but undoubtedly the tendency is to the spread of knowledge and technical skill adopted to the altered requirements. It is just possible that factory cheesemaking from pasteurized milk may in the course of a few years become the rule rather than as at present the exception.

SYNTHETIC MILK.

This manufacturing process of preparing a milk substitute from the soya bean is now so far advanced that more than one commercial company is engaged upon marketing it.

From the point of view of chemical composition the artificial milk is now an assured success. In physical appearance and the changes it undergoes in cooking, this vegetable milk is still in many respects far removed from the animal product.

It also remains to prove it to be a true substitute physiologically, not in the ordinary sense of being easily digestible and nutritious, but in that persons depending upon milk almost entirely, such as invalids and infants, may resort to the milk substitute, and find in it all the wholesome attributes provided in animal milk.

The manufacturers claim that the biological activity and the qualities in true milk that are responsible for its dietetic value are imparted to the synthetic milk by the introduction of a ferment preparation at a suitable stage, and therefore a wholly satisfactory substitute is provided.

Undoubtedly many improvements have been made during the past twelve months in the manufacture of synthetic milk, but the full claims of the manufacturers have still to be substantiated.

REPORT OF COMMITTEE OF BRITISH DAIRY FARMERS' ASSOCIATION ON THE UTILITY OF MILKING MACHINES.

THE Committee was appointed by the Council of the British Dairy Farmers' Association to inquire :—

1. As to the extent to which milking machines were being used in this country.
2. Whether the users of these machines are satisfied generally with the work which is being done by them.
3. Whether any ill results have accrued from their use to the cows, the milk, or the cheese manufactured from the milk.
4. Whether there is any saving in labour from the use of milking machines as compared with hand milking.
5. Whether there is any reason why, where the need arises, machines should not be used.

The inquiry was of an entirely practical character. The method adopted by the Committee was first to ascertain from the makers of the milking machines where such machines were in actual use.

This having been done, circular letters containing a number of questions were sent to those whose addresses had been ascertained. To the 217 letters sent out 115 replies were received, which in the large majority of cases were full and explicit and showed a desire on the part of such users to assist the Committee in their investigation.

The Committee then proceeded to make arrangements with farmers to see specimens of the machines actually at work, and were shown great courtesy and consideration by all to whom such approaches were made, and the Committee wish to express their warm thanks to them.

The machines inspected had been in use for periods varying from five months to seven years.

The Committee found :—

That while in a number of instances the machines were doing work of a fairly satisfactory character, the whole question is so wide and complicated that they do not feel justified in expressing a definite opinion on the points originally stated until further opportunities have been given of going more fully into the matter.

They venture to hope that at a suitable time further and more extended investigations may be made by the Association with a view to a more definite opinion being expressed.

In the meantime the Committee venture to express the opinion most emphatically, as the result of their extended observations, that hand milking by competent persons is much to be preferred to milking by machine, and would urge most strongly the vital necessity of encouragement being given to the younger members of the agricultural community to learn the art of milking, as in their opinion many years will elapse before the perfect milking machine—the equal of hand milking—will be available for general use by dairy farmers.

THE DAIRY SHOW OF 1915.

By SAMUEL R. WHITLEY, Rookwood, Shinfield, Reading.

THE arrangements for the Dairy Show of 1914 were more than half completed when war broke out in August, and the decision to carry the Show through when all the stands were let, and the schedule ready for issue, was comparatively easily arrived at; but in 1915 the Council of the British Dairy Farmers' Association had to face the question whether the usual standholders would be able and willing to support the Show, and whether exhibitors would risk sending their valuable animals when the railways and other means of transport were working under great difficulties.

The standholders of past years were consulted, and when the numerous replies were tabulated, there could be no doubt that the general consensus of opinion was strongly in favour of holding the Show as usual, many feeling that to abandon the Show would be a serious blow to the dairy industry. With a considerable financial loss as a result of last year's Show, and a consequent heavy drain on the invested funds of the Society, it was obvious that considerable savings in many directions must be made if the bold policy of holding the Show was to be carried through to a successful issue.

Many judges and stewards volunteered to give their services free of cost, and the total prize money was somewhat reduced; while minor economies in several directions were effected.

To the eye of the outsider the Show appeared much as usual, though a few empty stands proved that there was not the usual urgent demand for space, and the money received from stallholders was considerably short of the large total received during the last three or four years.

When the number of competitive entries is compared with those of recent years, the result, considering the difficult circumstances, must be held to be highly satisfactory to the Council—it is true that the aggregate was 100 below last year and 1,800 below the record of 1913; yet if a fair comparison is to be made, we must go back to the years of the Boer War, and then the entries for 1915 must be considered as satisfactory.

The comparative entries for the past 12 years is given below :—

| | 1904. | 1905. | 1906. | 1907. | 1908. | 1909. | 1910. | 1911. | 1912. | 1913. | 1914. | 1915. |
|--------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Cattle | 164 | 182 | 240 | 237 | 247 | 232 | 288 | 222 | 210 | 286 | 234 | 204 |
| Milking and Butter Tests | 167 | 217 | 247 | 245 | 224 | 236 | 264 | 213 | 209 | 265 | 167 | 198 |
| Goats | 46 | 51 | 51 | 48 | 72 | 84 | 75 | 81 | 105 | 110 | 85 | 116 |
| Poultry | 2,678 | 3,068 | 3,347 | 3,081 | 3,280 | 2,997 | 3,259 | 3,300 | 3,350 | 3,840 | 3,089 | 2,653 |
| Pigeons | 2,426 | 2,440 | 2,573 | 2,664 | 2,564 | 2,282 | 2,280 | 2,226 | 2,406 | 2,467 | 2,291 | 2,735 |
| Poultry and Pigeon Appliances | — | — | 55 | 65 | 50 | 37 | — | — | — | — | — | — |
| British Cheese... .. | 250 | 268 | 255 | 420 | 357 | 355 | 362 | 249 | 343 | 395 | 301 | 271 |
| Bacon and Hams | 46 | 49 | 39 | 57 | 76 | 55 | 104 | 58 | 71 | 89 | 67 | 45 |
| Butter | 556 | 641 | 578 | 593 | 668 | 535 | 525 | 484 | 618 | 549 | 371 | 339 |
| Cream | 44 | 52 | 42 | 35 | 47 | 42 | 47 | 26 | 48 | 43 | 27 | 20 |
| Skim-Milk Bread, &c. | 140 | 121 | 159 | 118 | 135 | 115 | 98 | 72 | 83 | 64 | 46 | 65 |
| Honey, &c. | 122 | 124 | 118 | 67 | 85 | 88 | 96 | 87 | 95 | 106 | 126 | 77 |
| Egg and Butter Packages | 20 | — | — | — | — | — | — | — | — | — | — | — |
| New and Improved Inventions | 43 | 22 | 17 | 33 | 37 | 31 | 34 | 21 | 25 | 41 | 24 | 6 |
| Vehicles for Conveying Milk | 25 | — | — | — | — | — | — | — | — | — | — | — |
| Roots | 184 | 170 | 156 | 177 | 181 | 218 | 196 | 172 | 190 | 190 | 59 | 51 |
| Buttermaking Contests | 172 | 206 | 199 | 200 | 207 | 120 | 145 | 165 | 165 | 141 | 97 | 101 |
| Milkers' Contests | 55 | 66 | 121 | 135 | 132 | 126 | 122 | 153 | 119 | 137 | 85 | 82 |
| | 7,138 | 7,677 | 8,197 | 8,175 | 8,362 | 7,553 | 7,895 | 7,529 | 8,127 | 8,723 | 7,069 | 6,963 |

The Show was held on October 19th, 20th, 21st and 22nd, and as at present arranged the dates of the future Dairy Shows will be:—

| | |
|-------|------------------------------------|
| 1916. | October 17th, 18th, 19th and 20th. |
| 1917. | „ 23rd, 24th, 25th and 26th. |
| 1918. | „ 22nd, 23rd, 24th and 25th. |
| 1919. | „ 21st, 22nd, 23rd and 24th. |

Owing to the Shows usually occupying the Agricultural Hall immediately in front of the Dairy Show being cancelled, erection of the stands and other equipment could be proceeded with several days before the usual time allowed, and these facilities helped materially in getting the work forward.

CATTLE.

The total entries of cattle numbered 204 against 210 in 1912, but throughout the various classes there were many absentees.

In Class 1, for *Pedigree Shorthorn Cows* entered in or eligible for Coates' Herd Book, there were 21 entries, but only 15 put in an appearance.

This was a strong class of good, typical Dairy Shorthorns carrying copious udders.

The first prize for Inspection was won by Mr. R. L. Mond's "Rosamond Queen," a cow somewhat small, but with a perfect udder, which she carried well. Mr. Mond also won the first prize in Milking Trials and Lord Desborough's Cup, and the extra prize given by the Shorthorn Society, with his cow "Marian 4th."

The *Pedigree Heifer Class* numbered 10 entries, but only four were forthcoming. First prize was won by a very good heifer.

The class for *Non-Pedigree Shorthorn Cows* was fairly well filled and contained some very good specimens, though no cow of outstanding merit as regards type and shape of udder.

Mr. J. L. Shirley's cow "Silverton Verona" was placed first for Inspection and was reserve in the Milking Trials. Mr. Sam Rangill's cow "Liberty" was second for Inspection, and made top score, 149.5 points in the Milking Trials, thus gaining the President's Cup, the Barham Challenge Cup, the Shirley Challenge Cup, and the Spencer Challenge Cup.

The Class for *Non-Pedigree Shorthorn Heifers* was only a weak one, but the first prizewinner for Inspection was also placed first in the Milking Trial, gaining the respectable total of 101.7 points.

Of the *Lincolnshire Red Shorthorns*, the judge considered that both classes were very good, especially the first four in the Cow class. The points gained in the Milking Trials by the *Lincoln Cows* were somewhat behind those of the *Pedigree Shorthorn Cows*, though in the Heifer class the *Lincolns* obtained a small advantage in points.

Fifteen *Jersey Cows* were presented to the judge, and he remarks that most of the exhibits were splendid dairy cattle, while the first five were all admirable show cows—the winner, Mr. Miller-Hallet's "My Pallas," being considered about perfect. This cow also had the distinction of being third in the Milking Trials.

The class for home-bred *Jersey Heifers* had to be cancelled, and the class for Island-bred *Heifers* was weak both in quantity and quality.

It is a pleasure to record that the improvement in *Guernsey* cattle exhibited at the Dairy Show during the last few years was well maintained, and 10 very nice cows were brought before the judge in the Cow class, and he remarks that the whole class was a credit to any breed.

Four *Guernsey Heifers* put in an appearance, and the winner was very highly spoken of by the judge.

In the Milking Trials, *Guernsey Cows* did quite creditably, the winners being comfortably above the standard of points fixed for the breed—this is a pleasant contrast to the experience of some recent years, when no Milking Trial prize could be awarded to the breed owing to their not obtaining the requisite points.

The class for *Red Poll Cows* brought six entries, but two were absent. The winner, Mr. Kenneth M. Clark's "*Sudbourne Queen*," was well to the fore both for Inspection and in the Milking Trials, though a long way behind the wonderful record in the Milking Trials of last year, when Mr. Clark's "*Sudbourne Minnie*" carried all before her in making the top Milking Trial score obtained in that Show.

The class for *Ayrshire Cows* had to be cancelled as was the case last year, and which may be due to the Council requiring that only *Pedigree Ayrshires* shall be shown. It seems a pity that such a splendid dairy breed should be unrepresented at the London Dairy Show—distance, usual time of calving, and now this more stringent requirement as to pedigree have closed the Show to *Ayrshires* as a breed.

South Devon Cows were only three in number, and they did not reach the standard of their breed in the Milking Trials.

The class for *Kerries* was cancelled; while that for *Dexters* brought five entries, but only two put in an appearance, both exceptionally good and showing great promise of being grand milkers.

The class for *British Holstein Cows* brought ten entries, and were considered a strong class. Two cows in the Milking Trials exceeded the standard points fixed for the breed, and so were awarded prizes.

The Classes 19 and 20, for Cows required by the Association for the purposes of their Milking Contests, were a very strong lot, and the judge was of opinion that these classes are improving year by year.

The class for *Shorthorn Bulls* was a good one. Eight bulls came into the ring. Mr. Godsell's "*Salmon's Premier*" won easily.

The *Jersey Bulls* were few in number and poor in quality.

GOATS.

The entries for goats again constituted a record for the Dairy Show, though the judge did not consider them, as a whole, up to the quality and milking capabilities that one would expect to find.

Sixteen goats were entered in the Milking Competition, and it is curious to note that every one of those that reached prize money had two points deducted for the fat in the milk being below 4 per cent.

and the first prizewinner did not even reach the legal standard of 3 per cent. fat.

The judge was, in general, more pleased with the Goatlings and Kids than with the older animals, and he gives as his opinion that there were a few goats of superlative merit, but the majority were not so good.

CHEESE.

The entries of *British Cheese* were 30 less than last year, but the total number compares very favourably with those of 1904, 1905, 1906 and 1911.

The general appearance of the cheese section of the Show was decidedly attractive.

Stillions.—The class for Six Cheeses had about the usual number of entries, all of which were of a high standard; the class for 36 Cheeses contained eight entries, all of which were well spoken of by the Judge.

Cheddars.—Classes 37, 38, and 39.

Class 37.—The entries in this class were good and the general quality of the cheeses excellent. The texture and flavour of the whole class was better than those in Classes 38 and 39. There was a general absence of bad flavour in the cheeses, only one lot being classed as bad.

Class 38.—Usually it is found that large Cheddar cheeses are softer and better in flavour than truckles of smaller size. In this class the reverse was the case. There were quite a large number of the entries considerably off in flavour, and not till about half-way through the class did the Judges find cheeses up to usual show quality. A number were bad in flavour, and many cheeses were badly discoloured and mottled in appearance. One lot which otherwise would have been placed very high in the list was rejected on account of bad selection on the part of the exhibitor, who had included in the lot a cheese of very indifferent quality. Altogether, this class was not satisfactory. Of the 48 entries the Judges selected only 13 lots as worthy of consideration.

Class 39 (20 Cheddars).—This was a good class. The cheeses were apparently younger than in the previous class. Flavour and texture were generally good, but a few of the lots were too acid, and others common in quality.

In some cases the selection of the cheeses had been badly made, thereby spoiling the chances of the competitors. It is remarkable that the first prize in each of the three classes of Cheddars was awarded to one individual maker.

Cheshire.—Contrasting with the above, while the entries were slightly less numerous than last year, the quality seems to have been excellent in all three classes, the Judges reporting as follows:—

“*Class 40 (20 Cheeses)*.—Exceptionally fine make of cheese, the winning lots being as near perfect as possible.

“*Class 41 (4 Coloured Cheeses)*.—A strong class, and, with few exceptions, of very fine quality.

"Class 42 (4 *Uncoloured Cheeses*).—There were several good lots in this class containing the necessary excellence of colour, texture, and flavour. On the other hand, there were one or two lots, as regards flavour, not quite clean; but, taken as a whole, there was little to find fault with."

Leicester (4 *Cheeses*) brought a slightly increased entry compared with last year, but the class was not of outstanding merit. Nearly all the entries were "too tight," and did not show the characteristic loose texture found in a typical *Leicester*. The colour of most of the exhibits was pale, and in some cases discolouration was present. The prize-winning cheeses were good, but with no outstanding features.

The class for *Lancashire* cheese was on the whole of very good quality; but, unfortunately, several otherwise excellent lots had one cheese out of the four showing some deficiency, which considerably affected the awards. The first and second prize winners were excellent and quite uniform, but the second prize failed slightly in texture and quality.

The class for *Derby Cheese* was a good one, nearly all the exhibits being clean in flavour and showing the true *Derby* texture.

The entries for *Double and Single Gloucester Cheese* showed a considerable falling off, but the quality in both classes was excellent.

Caerphilly Cheese brought two entries in excess of last year, and a high standard of quality was reached.

Only five entries were found in the class for *Wensleydales*, but those present were excellent.

Cream Cheese (made from cream only). This class brought 17 entries, but scarcely half showed the creamy-smooth close texture looked for in a well-made cream cheese. Many had been made too dry, causing the cheese to be hard and gritty, as well as detracting from the flavour. The Judge thought the class merited a third prize.

In the class for *Unripened Soft Cheese* the Coulommier type predominated, and the exhibits were considered very good.

There were no entries in the class for *Colonial Cheese*.

BACON AND HAMS.

The entries in the classes for *Bacon and Hams* showed a considerable falling off, which seems a pity in view of the fact that bacon curing is so closely allied to dairying. Suggestions as to how these classes can be improved would be very carefully considered by the Council. The quality of the exhibits on the whole was good, but the Judge considered that the pale bacon needed a little more drying.

BUTTER.

Entries in the *Butter* classes again showed a material decrease, being 32 below those of last year, which were lower than at any London Dairy Show during the last ten years. A decrease was to be expected, as there is no doubt that the exceptional value of whole milk has caused many to sell their milk instead of making butter.

The *Novice* Class was fairly well filled, and contained some good samples of butter, but there were only three entries for the *Champion* class.

One Judge reports :—

“Some excellent samples were shown in the 2-lb. Classes, but taking the classes throughout, the prevailing faults were : Spongy and sticky textures, while a few lots were strong in flavour and others rather insipid.”

Another Judge says :—

“The exhibits were defective in texture and the appearance and the make-up of the lots was poor, though the best butters were very good and there was little to choose in them.”

In the class for *Butter made from Scalded Cream only*, the samples were somewhat uneven, and some very gritty, showing signs of overheating the cream, while the prizewinners were good flavoured, close textured and well-made butters.

The general quality of the samples in the class for *Butter (free from salt)*, 2 lbs. in oblong pounds or bricks, shaped with Scotch hands, but without decoration or printing on top of pounds, was good, though in some cases the packing left much to be desired.

The new class instituted last year for 1 lb. of Butter made up in the most marketable design and sent by parcels post and opened in the presence of the judge, quality and packing to be considered in making the awards, was rather disappointing, though the first prize was easily won by a fine exhibit.

In connection with the suggestion made a year or two ago that, for the purposes of the 2 lb. Butter Classes, the country should be divided into districts and so make it possible for a larger number to compete on equal terms at the London Dairy Show, it is interesting to note that a very large proportion of the prizes and commendation cards went to Devon and Cornwall, thus tending to confirm the statement that certain districts do, in fact, possess material advantage over other districts. It might be well for the Council to consider this question again.

The classes for 24 lbs. in 12 rolls of Butter were slightly better filled than last year, and the quality, in general, was fairly good.

The *Commercial* classes for *Cured Butters* in 28 lb. and 56 lb. lots were also rather more numerous, and with one or two exceptions the exhibits were very good, the prizewinners being almost perfect.

There were only two entries in each class for Ornamental Butter, and in each case the first prize winner possessed outstanding merit.

The difficulties in transit accounted for a large drop in the *Colonial Butter Classes*—practically the whole of the exhibits came from Australia, there being only one or two others from New Zealand and South Africa.

CREAM.

The samples of *Clotted Cream* were in almost every case good, and some difficulty was experienced in awarding the prizes because

of the excellence of many of the exhibits. The Cream, other than Clotted, was also good, though entries in this class were by no means so numerous.

SKIM-MILK BREAD AND SCONES.

These classes contained 19 more entries than were present at last year's Show, though still far behind the entries made seven or eight years ago.

The object of these classes is to encourage the economic use of *Skim* or separated milk in bread-making and, as such, they are worthy of encouragement, and it is to be hoped that the entries will go on increasing in future years.

The classes both for *White and Brown Bread* were good, the prize-winners being well nigh perfect.

Seven entries appeared in the class for *Fancy Bread* and all appear to have been of fine quality and well baked.

There was a good class for *Home-made Bread*, both the prize-winners coming from Lancashire.

The class for *Scones* contained nine entries, the prizewinners being excellent both in quality and baking.

HONEY.

Although the number of exhibits in the Honey Classes did not quite reach the figure of those of a few previous years, the deficiency was made up by the excellence of the exhibits. The Light Honey Class and Medium Class were exceptionally good, and it was a difficult matter to award the prizes.

The Granulated Honey Class was one of the best, both with regard to the numbers and general excellence of the exhibits.

The Wax Class was also remarkably good.

It is to be regretted that the class for *Sections* was not better filled, the deficiency being, no doubt, due to the dry season in the comb-honey producing districts; however, the four exhibits staged were quite up to the Dairy Show standard.

Unfortunately, owing to the disarrangements of railway traffic, only one trophy was staged, but this well merited the first prize awarded.

ROOTS.

The number of *Root* exhibits was about the same as last year. The size and quality of the exhibits was up to the usual standard of the Dairy Show.

It is interesting to note that a very large proportion of the exhibits came from Wales, and almost the whole of the prize money went to Glamorganshire, Mr. John Perry, of Ampleforth College, Malton, Yorkshire, being the only notable exception, he winning first in both the *Swede* classes, the *Turnip* Class, and in the *Collection of Roots*.

INVENTIONS, &C.

Class 109.—*Any New Invention relating to the Dairy Industry, or one showing distinct and practical improvement, especially as to saving of labour, not eligible for competition in any other class and not previously exhibited in competition at the Dairy Show.*

“The Judge reports a small entry in this class, and only two were considered of sufficient merit to receive an award. No. 1123, a new method of fastening and labelling milk churns, was novel and useful and likely to be of considerable value to dairy farmers and to others sending milk by rail. To this exhibit a silver medal was awarded, and with some little alterations it will be of value in rendering the contents of railway milk churns proof against loss and of being tampered with in transit. No. 1125 was a milk pump exhibited by the Perfect Dairy Machines, Ltd. It has one great advantage over other milk pumps in that it is possible to shorten the stroke or *vice versa* while the pump is working, and thereby decrease or increase the delivery without interfering with the other machinery. By the use of this machine, milk can be cooled to varying temperatures according to the requirements of the manager of the creamery. To this exhibit a silver medal was awarded, and I am of opinion that this pump is a valuable addition to the dairy industry. One more exhibit deserves mention, and this was No. 1122, a new type of milking machine. In conjunction with Mr James Sadler I had the machine tested during the Show. The apparatus seemed simple and satisfactory, but as the tests were made under somewhat unfavourable conditions, I considered that no award could be safely given on the results of this single test, but that further tests were desirable, and it was referred to the Milking Machines Committee to have further trials carried out under more favourable conditions if thought necessary. Personally, I am of opinion that this machine has many good features.”

BUTTER-MAKING CONTESTS.

The total number of entries in these classes numbered 101, which is as large a number as can comfortably be accommodated during the Show. The Judges' reports stated that the work done by the competitors was up to the usual high standard that one expects to find at the Dairy Show.

The judge of the Championship Class says the work done was in every case satisfactory, and it was very difficult to differentiate between the first three, and beyond that most of the competitors lost points for smartness and tidiness in work—that is, in small details, probably due to over anxiety. The same judge also states that in his opinion the points awarded should be amended and brought more up-to-date, viz., the points given for ventilation of churn, of strainer and thermometer and salting, if they are not entirely cancelled, should be materially reduced.

MILKING CONTESTS.

These contests attracted 82 competitors, which is as many as can usually be accommodated during the Dairy Show. The competition was very keen.

In the Women and Girls' Section the judges had a difficulty in deciding, and owing to the excellence of the work and with a view to encouraging women milkers they agreed to recommend three special prizes.

Most of the competitors appeared to have had considerable experience at home, and were therefore, to a great extent, experts in milking.

In the Men's Classes there were some very capable milkers, and others who left much to be desired. Many of them approached the cow with the milking pail and the stool in the wrong hands, and the grip and action were by no means perfect—a jerky, rapid motion was too apparent, along with a faulty and loose grip. In comparison with the women competitors, the men by no means held their own.

The boys in their class were smart, and gave the judge great satisfaction.

The judge of the Championship Class reports the contest as the most severe he has ever had to decide, owing to the good work throughout.

THE MILKING TRIALS, 1915.

By F. J. LLOYD, F.C.S., F.I.C.

It will be spoken of in the future as one of the remarkable events of these eventful times that the Association was able to carry out its Milking Trials at the Dairy Show of 1915. The entries were good, amounting in all to 133 cows and heifers and 18 goats.

For one reason or another only 85 cows and heifers and 13 goats were actually able to compete, and the following short article, with its many tables, gives the results of this competition so far as the cows and heifers are concerned. The following table shows the number of animals tested in each class as compared with those in the five preceding years :—

| Cows. | | 1910. | 1911. | 1912. | 1913. | 1914 | 1915. |
|-----------------------------|--|-------|-------|-------|-------|------|-------|
| Pedigree Shorthorns | | 11 | 13 | 13 | 24 | 14 | 12 |
| Non-Pedigree Shorthorns ... | | 16 | 18 | 22 | 10 | 15 | 13 |
| Lincolnshire Red Shorthorns | | 8 | 7 | 8 | 7 | 5 | 6 |
| Jerseys | | 19 | 16 | 9 | 12 | 12 | 12 |
| Guernseys | | 3 | 1 | 4 | 10 | 6 | 10 |
| Red Polls | | 7 | 6 | 8 | 6 | 5 | 3 |
| Ayrshires | | 2 | 2 | 7 | 4 | — | — |
| South Devons | | 7 | 3 | 6 | 2 | 6 | 3 |
| British Holsteins | | — | — | — | — | 6 | 7 |
| Kerries | | 3 | 6 | 2 | 5 | — | 2 |
| Total ... | | 76 | 72 | 79 | 80 | 69 | 68 |
| HEIFERS. | | | | | | | |
| Pedigree Shorthorns | | 12 | 10 | 3 | 20 | 15 | 4 |
| Non-Pedigree Shorthorns ... | | 11 | 7 | 2 | 11 | 10 | 2 |
| Lincolnshire Red Shorthorns | | 6 | 6 | 6 | 5 | 4 | 4 |
| Red Polls | | 7 | 5 | 4 | 9 | 7 | 7 |
| Total ... | | 36 | 28 | 15 | 45 | 36 | 17 |
| Goats | | 13 | 21 | 15 | 23 | 14 | 13 |

The awards are made on points calculated from the weight of milk yielded and the composition of that milk. As it is well known that the yield of milk decreases as the period of lactation advances, allowance is also made for this factor.

The points awarded are as follows :—

One point for every 10 days since calving, deducting the first 40 days, with a maximum of 12 points.

One point for every pound of milk yielded in the day, taking the average of two days' yield.

Twenty points for every pound of butter fat contained in the milk as shown by analysis.

Four points for every pound of "solids other than fat" contained in the milk as shown by analysis.

In order to obtain the necessary facts for these calculations, the milk is weighed morning and evening on the Wednesday and Thursday of the Show. On the Wednesday I take a sample of each cow's milk both morning and evening. These are analysed, and the results are ready before the Thursday evening's milking, so that calculations may be started at once.

Probably few members realise that there are 10 calculations necessary for each cow in order to obtain her points; these have to be added, and any deductions removed before the final result is obtained.

These deductions are for each time the fat falls below 3 per cent., or the other solids below 8·5 per cent., 10 points.

Comparisons have at times been made between the butter yielded in the Butter Tests and the fat calculated in the Milking Trials, but the figures cannot be compared. The butter yield is from Wednesday's milk only; the Milking Trial figures are for two days. It is possible to calculate the actual fat yielded on the Wednesday from the figures contained in the tables appended hereto, if it is desired.

One effect of the War upon the writer has been to make him question the value of many things which in the past had been taken as a matter of course. One cannot help realising that there is a vast amount of serial literature which seems hardly ever read. Thousands of copies of journals of various societies are printed. How many are read? How much benefit do the members obtain from the articles? This is especially true of a report crowded with figures such as is the following. Individual exhibitors will probably study the figures relating to their own animals, or to a breed in which they are interested, but probably very few will ever attempt to study the report as a whole. Yet the figures reveal many important facts, and it may be worth while to draw attention to these at once, and then to proceed to the detailed information.

Improvement of Breeds.—The main object of these trials from the agricultural point of view is to try and improve the breeds of dairy cattle. The Society fixes a standard for each breed, to let dairy farmers know what good cows ought to be able to attain to. These standards are given in the first column of Table I. It is unfortunate that less than 44 per cent. of the animals exhibited came up to these standards. Here is evidently great room for improvement. Last year the figures were a little better, about 52 per cent. coming up to the standards.

Quality is what we must aim at in all dairy products; we can never hope to compete in quantity with the rest of the world. This applies to our cattle even more than to butter and cheese.

That, excepting in the four Shorthorn classes, the animals compared unfavourably with former years is also brought out in Table II, which shows the average number of points gained in each class for 10 years. This falling off in the average of each class is also found to apply to the best cows as well as to the many. Thus, on examining Table III, which gives the highest points gained in each breed for some years past, it will be noticed that nearly every breed fell short

For 10 cows to give milk below the 3 per cent. limit both morning and evening is probably unique. Most frequently when the morning's milk is poor the evening's milk makes up for the deficiency. This is well seen in many cases, such as Nos. 3, 11 and 20.

In solids other than fat the milk was in every instance above the Association standard of 8.5, and in fact was in the majority of cases above the averages of former years. Here again it is difficult to state the cause. But, judging from my experience, when milk is deficient in fat and above the normal in other solids, the most usual cause is the abundant use of food not well balanced in composition, and containing an excess of carbohydrates and a deficiency of nitrogenous constituents.

Cows Previously Tested.—Upon looking through past records of the Milking Trials I have been surprised to find how few of the animals have been competitors on more than one occasion. This year I have taken each animal in the cow classes—I, III, V and VII—and gone through the records of the past four years to see if they had been previously tested. The results are given in the following Table, and are, I think, well worth most careful study. The results are in some cases striking. No. 10 was shown in 1914; she gave then a little less milk. It was then below the 3 per cent. fat limit in the morning, and again this year showed a similar deficiency. No. 15 was shown as a heifer in 1913. Her milk then was exceptionally rich in fat. Now, two years later, although her milk yield has gone up 50 per cent., it still retains the quality of being exceptionally rich for a Shorthorn cow. In fact, this year there was not another cow in her class which gave anything like such rich milk.

No. 20. This cow was shown as a heifer in 1914. She now gives 80 per cent. more milk, but the milk is of poorer quality. The striking peculiarity about this cow was that although the quantity of milk given in the morning was nearly the same as that given in the evening, the latter contained 1.20 per cent. more fat, a difference so great as to be abnormal. Yet it is a remarkable coincidence that as a heifer last year her milk showed exactly the same peculiarity, the evening's milk containing 1.23 per cent. more fat than the morning's.

Passing now to the Non-pedigree Shorthorns, we find No. 32 giving a large increase of milk, but of poorer quality than in 1914. The same is true of No. 42. The fall in quantity of milk yielded, as also in the composition of that milk, with No. 44 appears to be abnormal. There was in all probability some special cause for this.

The single Lincolnshire Red which has been previously in the trials affords another opportunity of comparing a cow with her record as a heifer. Again we notice the tendency to give poor milk which was shown in 1914 repeated in 1915.

The most striking feature about the two Jersey cows is their constancy of milk production, both in quantity and quality, as is best shown by the total points gained.

TABLE SHOWING RESULTS GIVEN BY COWS WHICH HAVE COMPETED MORE THAN ONCE.

| Year. | No. | As Cow or Heifer. | MILK YIELDED. | | FAT IN MILK. | | SOLIDS IN MILK. | | Points Gained. | Breed. |
|-------|-----|-------------------|---------------|-------|--------------|-------|-----------------|-------|----------------|---|
| | | | Morn. | Even. | Total. | Morn. | Even. | Morn. | Even. | |
| 1914 | 15 | C | 29.0 | 25.0 | 54.0 | 2.40 | 3.26 | 11.58 | 12.50 | } Shorthorn, Pedigree. *105.7 *116.8 |
| 1915 | 10 | C | 33.3 | 27.0 | 60.3 | 2.87 | 2.93 | 11.66 | 11.88 | |
| 1913 | 49 | H | 14.4 | 12.0 | 27.3 | 4.61 | 4.43 | 14.34 | 13.99 | } Shorthorn, Pedigree. 62.6 97.0 |
| 1915 | 15 | C | 21.3 | 21.4 | 42.7 | 4.14 | 4.71 | 13.86 | 14.26 | |
| 1914 | 34 | H | 13.5 | 13.4 | 26.9 | 3.68 | 4.91 | 13.16 | 14.20 | } Shorthorn, Pedigree. 68.3 *97.3 |
| 1915 | 20 | C | 24.1 | 24.4 | 48.5 | 2.53 | 3.73 | 12.18 | 13.06 | |
| 1914 | 56 | C | 29.4 | 27.4 | 56.8 | 4.81 | 5.72 | 13.96 | 14.48 | } Shorthorn, Non-pedigree. 136.9 149.5 |
| 1915 | 32 | C | 36.1 | 31.8 | 67.9 | 3.92 | 4.48 | 13.02 | 13.74 | |
| 1912 | 40 | C | 26.2 | 20.1 | 46.3 | 4.20 | 5.80 | 13.40 | 14.88 | } Shorthorn, Non-pedigree. 96.3 119.5 |
| 1915 | 42 | C | 29.8 | 27.3 | 57.1 | 3.55 | 3.79 | 12.82 | 12.86 | |
| 1914 | 59 | C | 32.8 | 28.1 | 60.9 | 3.44 | 3.97 | 12.44 | 12.50 | } Shorthorn Non-pedigree. 127.3 *99.0 |
| 1915 | 44 | C | 25.4 | 22.9 | 48.3 | 2.91 | 3.88 | 12.26 | 13.22 | |
| 1914 | 92 | H | 23.5 | 20.9 | 44.4 | 2.49 | 3.23 | 11.60 | 12.34 | } Lincolnshire Red Shorthorn. *87.2 111.2 |
| 1915 | 65 | C | 29.7 | 24.5 | 54.2 | 3.02 | 3.91 | 11.98 | 13.00 | |
| 1914 | 99 | C | 20.4 | 19.6 | 40.0 | 4.48 | 4.92 | 13.32 | 13.70 | } Jersey. 93.9 98.6 |
| 1915 | 74 | C | 21.3 | 19.1 | 40.4 | 4.02 | 5.08 | 13.14 | 14.48 | |
| 1914 | 110 | C | 20.0 | 18.7 | 38.7 | 4.71 | 5.81 | 14.04 | 14.84 | } Jersey. 105.0 104.5 |
| 1915 | 87 | C | 20.2 | 18.7 | 38.9 | 4.91 | 5.13 | 14.28 | 14.26 | |

* These were actual points gained, without deduction for low fat contents.

In these four classes there were 43 animals exhibited, and only nine of these had been previously tested, and these only once in the past four years. It took far more time to go through the records than one would anticipate, but it has not been time lost. The results appear to throw much light upon many interesting problems of heredity and of breeding, also upon the quality of milk and the causes of fluctuation in its quality which have so perplexed all students.

It appears to me that a new and enhanced value would be given to the Milking Trials if, by the offer of some special prizes, the Association could induce owners to enter animals in the Milking Trials for three years in succession.

Averages v. Means.—There is always a danger of arriving at wrong conclusions by taking the average of a number of figures without discriminating between those which are normal and those which are obviously abnormal. For scientific work I prefer to take the mean, and exclude all abnormal results. This year there were more abnormal results than usual. Why, it is impossible to say. But they have most certainly affected the averages to a marked extent, and I purposely draw attention to this fact. A striking illustration is afforded by Class 15 (South Devons). Only three animals were exhibited, one gave exceptionally low results, was, in fact, quite abnormal. In estimating the mean she would be excluded, with what effect is shown by the following figures :—

| | | | Average. | | | Mean. | | |
|-------------------|----------|-----|----------|------|-----|-------|------|--|
| Weight of milk | —Morning | ... | ... | 22.2 | ... | ... | 25.3 | |
| | Evening | ... | ... | 18.4 | ... | ... | 21.7 | |
| | Total | ... | ... | 40.6 | ... | ... | 47.0 | |
| Percentage of fat | —Morning | ... | ... | 3.17 | ... | ... | 3.33 | |
| | Evening | ... | ... | 3.60 | ... | ... | 3.73 | |
| Points gained | | | ... | 80.6 | ... | ... | 97.7 | |

Where a large number of figures are dealt with, one or two abnormal results do not, of course, materially affect the average.

The usual tables are appended hereto.

TABLE I.—SHOWING THE NUMBER OF COWS COMING UP TO THE SOCIETY'S STANDARD.

| Cows. | Standard. | Cows Tested. | Average Points Gained. | Cows above Standard. | Average Points of Cows above Standard. |
|--------------------------------------|-----------|--------------|------------------------|----------------------|--|
| Shorthorns, Pedigree | 100 | 12 | 103.5 | 5 | 118.6 |
| Shorthorn Pedigree Heifers | 66 | 4 | 65.5 | 2 | 73.8 |
| Shorthorns, Non-Pedigree | 110 | 13 | 118.5 | 9 | 127.3 |
| Shorthorn Non-Pedigree Heifers | 73 | 2 | 75.7 | 1 | 101.7 |
| Lincolnshire Reds | 100 | 6 | 94.9 | 2 | 111.0 |
| Lincolnshire Red Heifers | 66 | 4 | 57.9 | 2 | 78.6 |
| Jerseys | 95 | 12 | 76.5 | 4 | 109.6 |
| Guernseys | 85 | 10 | 82.6 | 3 | 93.0 |
| Red Polls | 90 | 3 | 89.0 | 1 | 107.0 |
| Red Poll Heifers | 60 | 7 | 66.0 | 6 | 71.5 |
| Ayrshires | 90 | — | — | — | — |
| South Devons | 100 | 3 | 80.6 | 0 | — |
| Dexters | 80 | 2 | 61.3 | 0 | — |
| British Holsteins | 110 | 7 | 92.3 | 2 | 115.2 |
| Total | — | 85 | — | 37 | — |

TABLE II.—AVERAGE POINTS GAINED IN THE MILKING TRIALS FOR THE PAST 10 YEARS.

| Year. | Shorthorn. Pedigree. | Shorthorn Pedigree Heifers. | Shorthorn Non-Pedigree. | Shorthorn Non-Pedigree Heifers. | Lincolnshire Red Shorthorn. | Lincolnshire Heifers. | Jerseys. | Guernseys | Red Poll Cows. | Red Poll Heifers. | Ayrshires | Dexters. | Kerries. | South Devons | British Holsteins. |
|---------|-------------------------|-----------------------------------|----------------------------|---------------------------------------|-----------------------------------|--------------------------|----------|-----------|-------------------|----------------------|-----------|----------|----------|--------------|-----------------------|
| 1906 .. | 88.0 | — | 93.2 | — | — | — | 83.9 | 83.6 | 76.5 | — | 85.4 | 65.8 | 81.3 | 111.5 | — |
| 1907 .. | 94.6 | — | 102.4 | — | 103.6 | — | 86.9 | 84.6 | 90.6 | — | 54.3 | 70.5 | 91.1 | — | — |
| 1908 .. | 99.5 | — | 103.6 | — | 95.7 | — | 82.3 | 80.7 | 74.1 | — | 62.6 | 68.8 | 74.3 | — | — |
| 1909 .. | 97.5 | — | 108.4 | — | 101.7 | — | 88.6 | 73.3 | 86.4 | — | — | — | 70.2 | 93.7 | — |
| 1910 .. | 109.5 | — | 109.4 | — | 99.4 | — | 90.5 | 77.9 | 95.5 | — | 74.6 | — | 89.1 | 107.2 | — |
| 1911 .. | 89.0 | 61.4 | 112.2 | 76.5 | 103.5 | 65.9 | 91.9 | 88.8 | 80.2 | 63.7 | 54.3 | — | 67.0 | 104.1 | — |
| 1912 .. | 98.0 | 40.3 | 124.4 | 79.4 | 95.5 | 67.3 | 94.5 | 71.0 | 96.3 | 75.9 | 79.6 | — | 93.3 | 110.6 | — |
| 1913 .. | 95.2 | 63.2 | 117.1 | 75.2 | 95.7 | 69.0 | 90.4 | 77.3 | 95.5 | 68.8 | 107.6 | — | 63.3 | 103.9 | — |
| 1914 .. | 106.5 | 62.4 | 108.9 | 73.6 | 96.3 | 67.7 | 89.8 | 85.5 | 127.6 | 65.5 | — | 61.3 | — | 109.5 | 80.7 |
| 1915 .. | 103.5 | 65.5 | 118.5 | 75.7 | 94.9 | 57.9 | 76.5 | 82.6 | 89.0 | 66.0 | — | — | — | 76.0 | 92.3 |

TABLE III.—SHOWING THE HIGHEST POINTS GAINED DURING THE PAST 8 YEARS.

| Year. | Shorthorn. Pedigree. | Shorthorn Pedigree Heifers. | Shorthorn Non-Pedigree. | Shorthorn Non-Pedigree Heifers. | Lincolnshire Red Shorthorn. | Lincolnshire Heifers. | Jerseys. | Guernseys | Red Poll Cows. | Red Poll Heifers. | Ayrshires | Dexters. | Kerries. | South Devons | British Holsteins. |
|---------|-------------------------|-----------------------------------|----------------------------|---------------------------------------|-----------------------------------|--------------------------|----------|-----------|-------------------|----------------------|-----------|----------|----------|--------------|-----------------------|
| 1908 .. | 139.2 | 74.0 | 133.0 | 88.7 | 115.9 | — | 100.7 | 94.1 | 93.6 | 72.4 | 82.1 | — | 104.3 | — | — |
| 1909 .. | 128.9 | 88.4 | 142.7 | 89.0 | 144.4 | 66.2 | 129.2 | 84.7 | 108.8 | 74.5 | — | — | 77.4 | 120.9 | — |
| 1910 .. | 136.7 | 85.7 | 138.5 | 85.1 | 124.2 | 81.1 | 111.6 | 82.5 | 120.0 | 79.6 | 87.7 | — | 100.3 | 135.6 | — |
| 1911 .. | 153.3 | 76.7 | 143.0 | 108.8 | 133.5 | 89.1 | 115.4 | 88.8 | 120.3 | 70.9 | 75.7 | — | 92.9 | 112.7 | — |
| 1912 .. | 125.6 | 57.7 | 169.5 | 106.7 | 130.4 | 89.1 | 117.9 | 85.0 | 122.7 | 90.8 | 90.9 | — | 102.8 | 144.8 | — |
| 1913 .. | 127.6 | 88.6 | 158.0 | 109.1 | 114.8 | 81.2 | 123.1 | 93.8 | 120.5 | 81.2 | 130.2 | — | 93.7 | 115.7 | — |
| 1914 .. | 144.8 | 98.1 | 138.9 | 97.6 | 105.5 | 77.2 | 112.2 | 99.7 | 144.9 | 98.1 | — | 68.0 | — | 133.8 | 103.6 |
| 1915 .. | 125.8 | 79.1 | 149.5 | 101.7 | 111.2 | 80.2 | 104.5 | 96.7 | 107.0 | 82.1 | — | — | — | 99.2 | 116.3 |

TABLE IV.—QUANTITY AND QUALITY OF MILK, 1910-1915.

| Breed. | Year. | No. of Animals | Average Weight of Milk. | | Total Weight of Milk. | Percentage Composition of Milk | | | | | |
|------------------------------------|-------|----------------|-------------------------|-------|-----------------------|--------------------------------|-------|------------------|-------|--------------|-------|
| | | | | | | Fat. | | Solids, not Fat. | | Total Solids | |
| | | | Morn. | Even. | | Morn. | Even. | Morn. | Even. | Morn. | Even. |
| Shorthorns, Pedigree | 1910 | 11 | 26.0 | 24.0 | 50.0 | 3.77 | 4.25 | 9.08 | 9.03 | 12.85 | 13.28 |
| | 1911 | 13 | 23.8 | 21.5 | 45.3 | 3.23 | 3.75 | 9.21 | 8.95 | 12.44 | 12.70 |
| | 1912 | 13 | 24.5 | 21.8 | 46.3 | 3.66 | 4.01 | 9.16 | 9.13 | 12.82 | 12.14 |
| | 1913 | 24 | 24.9 | 22.9 | 47.8 | 3.39 | 3.67 | 9.06 | 8.94 | 12.45 | 12.61 |
| | 1914 | 14 | 26.4 | 23.8 | 50.2 | 3.60 | 4.09 | 9.18 | 9.08 | 12.78 | 13.17 |
| | 1915 | 12 | 28.2 | 25.4 | 53.6 | 3.17 | 3.54 | 9.32 | 9.16 | 12.49 | 12.70 |
| Shorthorns, Pedigree (Heifers) | 1910 | 12 | 16.6 | 15.2 | 31.8 | 3.22 | 3.74 | 9.42 | 9.29 | 12.64 | 13.03 |
| | 1911 | 10 | 16.8 | 14.9 | 31.7 | 3.24 | 3.41 | 9.21 | 9.21 | 12.45 | 12.61 |
| | 1912 | 3 | 12.9 | 11.3 | 24.2 | 3.47 | 3.13 | 9.44 | 9.34 | 12.81 | 12.47 |
| | 1913 | 20 | 14.9 | 13.9 | 28.8 | 3.71 | 4.16 | 9.26 | 9.05 | 12.97 | 13.21 |
| | 1914 | 15 | 15.8 | 14.1 | 29.9 | 3.26 | 3.89 | 9.19 | 9.08 | 12.45 | 12.97 |
| | 1915 | 4 | 17.6 | 15.2 | 32.8 | 3.76 | 3.63 | 9.45 | 9.52 | 13.21 | 13.15 |
| Shorthorns, Non-Pedigree Cows | 1910 | 16 | 27.0 | 24.7 | 51.7 | 3.60 | 4.08 | 8.97 | 8.94 | 12.57 | 13.02 |
| | 1911 | 18 | 29.0 | 26.2 | 55.2 | 3.43 | 4.36 | 9.26 | 8.95 | 12.69 | 13.37 |
| | 1912 | 22 | 31.4 | 28.3 | 59.7 | 3.69 | 4.29 | 9.11 | 8.94 | 12.80 | 13.23 |
| | 1913 | 10 | 29.8 | 28.6 | 58.4 | 3.72 | 3.92 | 8.97 | 8.77 | 12.69 | 12.69 |
| | 1914 | 15 | 27.9 | 25.1 | 53.0 | 3.52 | 4.10 | 8.97 | 8.86 | 12.49 | 12.96 |
| | 1915 | 13 | 30.4 | 27.4 | 57.8 | 3.80 | 3.69 | 9.16 | 9.16 | 12.96 | 12.85 |
| Shorthorns, Non-Pedigree (Heifers) | 1910 | 11 | 16.6 | 16.0 | 32.6 | 3.31 | 3.72 | 9.33 | 9.24 | 12.64 | 12.96 |
| | 1911 | 7 | 19.3 | 17.7 | 37.0 | 3.51 | 3.72 | 9.51 | 9.25 | 13.03 | 12.99 |
| | 1912 | 2 | 19.7 | 18.6 | 38.3 | 3.57 | 4.31 | 9.41 | 9.39 | 12.98 | 13.70 |
| | 1913 | 11 | 19.0 | 17.4 | 36.4 | 3.76 | 4.16 | 8.99 | 8.87 | 12.75 | 13.03 |
| | 1914 | 10 | 19.0 | 16.7 | 35.7 | 3.41 | 3.66 | 9.28 | 9.17 | 12.69 | 12.83 |
| | 1915 | 2 | 20.3 | 18.4 | 38.7 | 3.03 | 3.81 | 9.41 | 9.31 | 12.44 | 13.12 |

TABLE IV.—QUANTITY AND QUALITY OF MILK, 1910-1915—Continued.

| Breed. | Year. | No. of Animals. | Average Weight of Milk. | | Total Weight of Milk. | Percentage Composition of Milk | | | | | |
|-----------------------------|-------|-----------------|-------------------------|-------|-----------------------|--------------------------------|-------|------------------|-------|---------------|-------|
| | | | Morn. | Even. | | Fat. | | Solids, not Fat. | | Total Solids. | |
| | | | | | | Morn. | Even. | Morn. | Even. | Morn. | Even. |
| Lincolnshire Red Shorthorns | 1910 | 8 | 24.1 | 21.5 | 45.6 | 3.60 | 4.00 | 9.03 | 8.96 | 12.63 | 12.96 |
| | 1911 | 7 | 26.4 | 23.7 | 50.1 | 3.19 | 4.66 | 9.05 | 8.85 | 12.24 | 13.51 |
| | 1912 | 8 | 24.0 | 22.2 | 46.2 | 3.41 | 3.96 | 9.24 | 9.02 | 12.65 | 12.92 |
| | 1913 | 7 | 26.2 | 21.4 | 47.6 | 3.58 | 3.48 | 8.73 | 8.74 | 12.31 | 12.63 |
| | 1914 | 5 | 26.2 | 22.6 | 48.8 | 3.22 | 3.48 | 8.99 | 9.15 | 12.63 | 12.63 |
| | 1915 | 6 | 29.3 | 24.8 | 54.1 | 3.00 | 2.92 | 9.11 | 9.18 | 12.11 | 12.10 |
| | 1910 | — | — | — | — | — | — | — | — | — | — |
| Lincolnshire Red Heifers | 1911 | 6 | 16.8 | 15.5 | 32.3 | 3.28 | 3.70 | 9.32 | 9.33 | 12.60 | 13.03 |
| | 1912 | 6 | 16.6 | 15.6 | 32.2 | 3.67 | 3.75 | 9.18 | 9.03 | 12.85 | 12.78 |
| | 1913 | 5 | 18.5 | 16.8 | 35.3 | 3.51 | 3.74 | 9.09 | 9.00 | 12.60 | 12.74 |
| | 1914 | 4 | 18.5 | 16.3 | 34.8 | 3.14 | 3.69 | 9.28 | 9.16 | 12.42 | 12.85 |
| | 1915 | 4 | 18.8 | 16.7 | 35.5 | 2.68 | 3.12 | 9.32 | 9.36 | 12.00 | 12.48 |
| | 1910 | 19 | 18.6 | 15.9 | 34.5 | 5.15 | 5.66 | 9.17 | 9.08 | 14.32 | 14.74 |
| | 1911 | 16 | 19.6 | 17.3 | 36.9 | 4.65 | 5.31 | 9.24 | 9.06 | 13.89 | 14.37 |
| Jerseys | 1912 | 9 | 20.2 | 17.3 | 37.5 | 4.40 | 5.39 | 9.17 | 9.03 | 13.57 | 14.42 |
| | 1913 | 12 | 18.4 | 16.6 | 35.0 | 4.33 | 5.34 | 9.21 | 9.01 | 13.74 | 14.35 |
| | 1914 | 12 | 18.4 | 16.7 | 35.1 | 4.67 | 5.15 | 9.40 | 9.15 | 14.07 | 14.30 |
| | 1915 | 12 | 16.0 | 14.4 | 30.4 | 4.59 | 4.99 | 9.44 | 9.41 | 14.02 | 14.40 |
| | 1910 | 3 | 17.4 | 14.6 | 32.0 | 4.11 | 4.94 | 9.26 | 9.12 | 13.37 | 14.06 |
| | 1911 | 1 | 18.7 | 15.3 | 34.0 | 4.16 | 4.70 | 9.32 | 9.46 | 13.48 | 14.16 |
| | 1912 | 4 | 15.9 | 14.1 | 30.0 | 4.47 | 5.24 | 9.02 | 8.91 | 13.49 | 14.15 |
| Guernseys | 1913 | 10 | 16.1 | 13.6 | 29.7 | 4.72 | 5.35 | 9.30 | 9.17 | 14.02 | 14.52 |
| | 1914 | 6 | 19.2 | 15.7 | 34.9 | 4.52 | 5.04 | 9.54 | 9.46 | 14.06 | 14.50 |
| | 1915 | 10 | 18.3 | 15.1 | 33.4 | 4.50 | 4.69 | 9.43 | 9.45 | 13.93 | 14.14 |
| | 1910 | 7 | 22.3 | 19.1 | 41.4 | 3.75 | 4.14 | 9.21 | 9.14 | 12.96 | 13.28 |
| | 1911 | 6 | 19.9 | 17.9 | 37.8 | 3.29 | 4.15 | 9.20 | 9.08 | 12.49 | 13.23 |
| | 1912 | 8 | 24.9 | 21.2 | 46.1 | 3.50 | 3.65 | 9.13 | 9.09 | 12.63 | 12.74 |
| | 1913 | 6 | 26.4 | 23.0 | 49.4 | 3.14 | 3.58 | 8.96 | 8.69 | 12.10 | 12.27 |
| Red Poll Cows | 1914 | 5 | 31.7 | 28.6 | 58.5 | 3.99 | 3.73 | 9.13 | 9.31 | 13.12 | 13.04 |
| | 1915 | 3 | 22.9 | 20.5 | 43.4 | 3.42 | 3.42 | 9.47 | 9.23 | 12.89 | 12.65 |

TABLE IV.—QUANTITY AND QUALITY OF MILK, 1910-1915—Continued.

| Breed. | Year. | No. of Animals | Average Weight of Milk. | | Total Weight of Milk. | Percentage Composition of Milk. | | | | | |
|-------------------|-------|----------------|-------------------------|-------|-----------------------|---------------------------------|-------|---------------|-------|-------|-------|
| | | | Fat. | | | Solids, not Fat. | | Total Solids. | | | |
| | | | Morn. | Even. | | Morn. | Even. | Morn. | Even. | | |
| Red Poll Heifers | 1910 | 7 | 17.2 | 15.6 | 32.8 | 3.56 | 4.12 | 9.50 | 9.39 | 13.06 | 13.51 |
| | 1911 | 5 | 15.5 | 14.4 | 29.9 | 3.66 | 4.30 | 9.30 | 9.32 | 12.96 | 13.63 |
| | 1912 | 4 | 17.8 | 16.3 | 34.1 | 3.95 | 4.00 | 9.49 | 9.47 | 13.45 | 13.47 |
| | 1913 | 9 | 16.3 | 14.7 | 31.0 | 3.80 | 4.02 | 9.34 | 9.05 | 13.14 | 13.07 |
| | 1914 | 7 | 17.3 | 15.4 | 32.7 | 3.36 | 3.43 | 9.26 | 9.24 | 12.62 | 12.67 |
| Ayrshires Cows | 1915 | 7 | 17.8 | 16.4 | 34.2 | 3.37 | 3.72 | 9.62 | 9.36 | 12.99 | 13.09 |
| | 1910 | 2 | 18.8 | 19.3 | 38.1 | 3.31 | 3.68 | 8.64 | 8.47 | 11.95 | 12.15 |
| | 1911 | 2 | 17.4 | 17.4 | 34.8 | 2.72 | 3.38 | 8.71 | 8.59 | 10.93 | 11.97 |
| | 1912 | 7 | 21.5 | 19.2 | 40.7 | 3.48 | 3.75 | 9.28 | 9.10 | 12.76 | 12.85 |
| | 1913 | 4 | 25.3 | 22.5 | 47.8 | 4.15 | 4.34 | 9.57 | 9.27 | 13.72 | 13.61 |
| South Devons | 1914 | — | — | — | — | — | — | — | — | — | — |
| | 1915 | — | — | — | — | — | — | — | — | — | — |
| | 1910 | 7 | 26.2 | 24.9 | 51.1 | 3.44 | 3.88 | 9.25 | 9.04 | 12.69 | 12.92 |
| | 1911 | 3 | 26.8 | 23.0 | 49.8 | 3.21 | 3.62 | 9.23 | 9.09 | 12.44 | 12.72 |
| | 1912 | 6 | 25.1 | 22.9 | 48.0 | 3.86 | 4.14 | 9.36 | 9.18 | 13.22 | 13.32 |
| Kerry Cows | 1913 | 2 | 25.1 | 21.8 | 46.9 | 4.09 | 3.80 | 9.19 | 9.06 | 13.28 | 12.86 |
| | 1914 | 6 | 26.5 | 25.4 | 51.9 | 3.25 | 3.87 | 9.31 | 9.19 | 12.56 | 13.06 |
| | 1915 | 3 | 22.2 | 18.4 | 40.6 | 3.17 | 3.60 | 9.29 | 9.06 | 12.46 | 12.66 |
| | 1910 | 3 | 19.9 | 19.2 | 39.1 | 4.04 | 4.81 | 9.06 | 8.86 | 13.10 | 13.67 |
| | 1911 | 6 | 16.9 | 14.7 | 31.6 | 3.48 | 3.92 | 9.11 | 9.04 | 12.59 | 12.97 |
| Dexters | 1912 | 2 | 21.3 | 19.9 | 41.2 | 3.81 | 5.03 | 9.32 | 9.21 | 13.13 | 14.24 |
| | 1913 | 5 | 16.9 | 14.3 | 31.2 | 3.97 | 4.18 | 9.24 | 9.24 | 13.21 | 13.42 |
| | 1914 | — | — | — | — | — | — | — | — | — | — |
| | 1915 | 2 | 15.0 | 13.5 | 28.5 | 3.61 | 3.81 | 9.20 | 9.13 | 12.81 | 12.94 |
| | 1910 | 6 | 21.6 | 18.8 | 40.4 | 3.18 | 3.59 | 8.99 | 8.96 | 12.17 | 12.55 |
| British Holsteins | 1914 | — | — | — | — | — | — | — | — | — | — |
| | 1915 | 7 | 26.0 | 23.8 | 49.8 | 2.80 | 3.58 | 8.91 | 8.90 | 11.71 | 12.18 |

TABLE V.—NUMBER OF ANIMALS YIELDING MILK DEFICIENT IN FAT OR OTHER SOLIDS.

| | Less than 3 per cent. of Fat. | | | | | | Less than 8·5 per cent. of other Solids | | | | | |
|---------------------------------|----------------------------------|------|------|------|---------------|---------------|--|------|------|------|---------------|---------------|
| | 1910 | 1911 | 1912 | 1913 | 1914 | 1915 | 1910 | 1911 | 1912 | 1913 | 1914 | 1915 |
| Cows. | | | | | | | | | | | | |
| Shorthorns, Pedigree | 1 | 5 | 3 | 6 | 2 | 6 | 0 | 1 | 0 | 3 | 0 | 0 |
| Shorthorns, Non-Pedigree . . | 2 | 6 | 5 | 3 | 4 | 4 | 1 | 3 | 2 | 3 | 2 | 0 |
| Shorthorns, Lincoln Reds . . | 1 | 4 | 2 | 0 | 2 | 5 | 0 | 0 | 0 | 1 | 0 | 0 |
| Jerseys | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 |
| Guernseys | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Red Polls | 0 | 2 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Kerries | 0 | 0 | 0 | 0 | No Entries | — | 0 | 1 | 0 | 0 | No Entries | — |
| South Devons . . | 2 | 1 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | — |
| Ayrshires | 0 | 1 | 2 | 0 | No Entries | No Entries | 0 | 1 | 1 | 0 | No Entries | No Entries |
| British Holsteins | — | — | — | — | 4 | 5 | — | — | — | — | 0 | 0 |
| HEIFERS. | | | | | | | | | | | | |
| Shorthorns, Pedigree | 4 | 4 | 2 | 1 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Shorthorns, Non-Pedigree . . | 5 | 2 | 1 | 1 | 2 | 1 | 0 | 0 | 0 | 2 | 0 | 0 |
| Shorthorns, Lincoln Reds . . | 3 | 1 | 1 | 2 | 2 | 3 | 0 | 0 | 0 | 1 | 0 | 0 |
| Red Polls | 1 | 1 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 19 | 28 | 19 | 15 | 22 | 29 | 4 | 7 | 3 | 11 | 2 | 0 |

MILKING TRIALS, 1915.
CLASS 1.—SHORTHORN COWS.

| Number ... Name ... | ... | ... | ... | 1 Kingshorpe, Bannock, 4th | 3 Lilac 7th. | 4 Marian 4th. | 5 Fair Rosamond. |
|---|-----|-----|-----|-------------------------------|-----------------|--|--|
| Born ... | ... | ... | ... | Feb. 28, 1909. | April 30, 1911. | Mar. 16, 1908. | Sept. 1, 1910. |
| Number of Calves ... | ... | ... | ... | Sept. 5. | Sept. 27. | Oct. 4. | Sept. 3. |
| Last Calved ... | ... | ... | ... | 45 | 23 | 16 | 47 |
| Days since Calving ... | ... | ... | ... | | | | |
| Weight of Milk, 1st day | ... | ... | ... | Morn Even | Morn Even | Morn Even | Morn Even |
| Weight of Milk, 2nd day | ... | ... | ... | 24.3 20.4 | 33.7 29.5 | 32.7 27.6 | 28.7 27.5 |
| Total ... | ... | ... | ... | 25.0 21.6 | 35.0 29.1 | 32.6 27.9 | 31.2 28.6 |
| Average ... | ... | ... | ... | 50.0 42.0 | 68.7 58.6 | 65.3 55.5 | 59.9 56.1 |
| Percentage { Fat ... | ... | ... | ... | 25.0 21.0 | 34.3 29.3 | 32.6 27.7 | 29.9 28.0 |
| Composition of { Solids other than Fat | ... | ... | ... | 3.88 3.18 | 2.79 3.47 | 3.51 3.51 | 3.48 3.78 |
| the Milk. { Solids ... | ... | ... | ... | 9.36 9.30 | 9.03 8.89 | 9.69 9.69 | 9.28 9.14 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | 13.24 12.48 | 11.82 12.36 | 13.20 13.20 | 12.76 12.92 |
| Calculation of Points multiply by 20 | ... | ... | ... | .97 .67 | .96 1.02 | 1.14 .97 | 1.04 1.06 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | 19.4 13.4 | 19.2 20.4 | 22.8 19.4 | 20.8 21.2 |
| Calculation of Points multiply by 4 | ... | ... | ... | 2.34 1.95 | 3.10 2.6 | 3.15 2.68 | 2.78 2.56 |
| Points { For time since Calving ... | ... | ... | ... | 9.36 7.80 | 12.40 10.4 | 12.60 10.72 | 11.12 10.24 |
| { For weight of Milk ... | ... | ... | ... | .5 | — | — | .7 |
| { For weight of Fat ... | ... | ... | ... | 46.0 | 63.6 | 60.3 | 57.9 |
| { For weight of Solids other than Fat | ... | ... | ... | 32.8 | 39.6 | 42.2 | 42.0 |
| Total ... | ... | ... | ... | 17.2 | 22.8 | 23.3 | 21.4 |
| Deductions ... | ... | ... | ... | 96.5 | 126.0 | 125.8 | 122.0 |
| Points gained | ... | ... | ... | — | 10.0 | — | — |
| Remarks and Awards ... | ... | ... | ... | 96.5 | 116.0 | 125.8 | 122.0 |
| | ... | ... | ... | Reserve. | — | 1st Prize and Desborough Cup, Shorthorn Society's Prize. | 2nd Prize and Reserve for Desborough Cup, Shorthorn Society's Prize. |

| Number | ... | ... | ... | ... | ... | 6 | 10 | 11 | 13 |
|---|-----|-----|-----|-----|-----|--------------------|----------------|----------------------|-----------------|
| Name | ... | ... | ... | ... | ... | Rosamond Queen. | Melody 13th. | Barmington Rose 3rd. | Leazow Musical. |
| Born | ... | ... | ... | ... | ... | May 10, 1908. | Mar. 11, 1909. | Mar. 16, 1909. | May 31, 1910. |
| Number of Calves | ... | ... | ... | ... | ... | — | — | 3 | 2 |
| Last Calved | ... | ... | ... | ... | ... | Sept. 22. | Sept. 9. | Sept. 22. | Oct. 5. |
| Days since Calving | ... | ... | ... | ... | ... | 28 | 41 | 28 | 15 |
| Weight of Milk, 1st day | ... | ... | ... | ... | ... | Morn | Even | Morn | Even |
| Weight of Milk, 2nd day | ... | ... | ... | ... | ... | 29.1 | 28.0 | 24.4 | 23.0 |
| Total | ... | ... | ... | ... | ... | 28.2 | 26.0 | 24.1 | 22.6 |
| Average | ... | ... | ... | ... | ... | 57.3 | 54.0 | 48.5 | 45.6 |
| Percentage (Fat ...) | ... | ... | ... | ... | ... | 28.6 | 27.0 | 24.2 | 22.8 |
| Composition of Solids other than Fat | ... | ... | ... | ... | ... | 3.26 | 2.93 | 2.39 | 4.21 |
| the Milk. (Solids ...) | ... | ... | ... | ... | ... | 9.26 | 8.95 | 9.09 | 8.71 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | ... | ... | 12.32 | 11.88 | 11.48 | 12.92 |
| Calculation of Points multiply by 20 | ... | ... | ... | ... | ... | .93 | .79 | .58 | .96 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | ... | 18.6 | 15.8 | 11.6 | 19.2 |
| Calculation of Points multiply by 4 | ... | ... | ... | ... | ... | 2.65 | 2.42 | 2.20 | 2.0 |
| Points { For time since Calving | ... | ... | ... | ... | ... | 10.60 | 9.68 | 8.80 | 8.0 |
| { For weight of Milk | ... | ... | ... | ... | ... | 54.3 | 60.3 | 47.0 | 57.0 |
| { For weight of Fat | ... | ... | ... | ... | ... | 35.6 | 35.0 | 30.8 | 41.0 |
| { For weight of Solids other than Fat | ... | ... | ... | ... | ... | 20.0 | 21.4 | 16.8 | 21.4 |
| Total | ... | ... | ... | ... | ... | 109.9 | 116.8 | 94.6 | 119.4 |
| Deductions | ... | ... | ... | ... | ... | — | 20.0 | 10.0 | — |
| Points gained | ... | ... | ... | ... | ... | 109.9 | 96.8 | 84.6 | 119.4 |
| Remarks and Awards | ... | ... | ... | ... | ... | High Commendation. | | | 3rd Prize. |

CLASS 1.—SHORTHORN COWS—Continued.

| Number ... | ... | ... | ... | 15 | 17 | 18 | 20 |
|---|-----|-----|-----|--------------------|----------------|-----------------|---------------------|
| Name ... | ... | ... | ... | Cockham Birthright | Haynes Lilly | Sweet Rush | Chewton Mosrose 4th |
| Born ... | ... | ... | ... | Mar. 25, 1911. | Mar. 14, 1910. | April 15, 1910. | Dec. 6, 1911. |
| Number of Calves ... | ... | ... | ... | 3 | 5 | — | 1 |
| Last Calved ... | ... | ... | ... | Sept. 21. | Aug. 1. | Oct. | Oct. 1. |
| Days since Calving | ... | ... | ... | 29 | 80 | — | 19 |
| Weight of Milk, 1st day | ... | ... | ... | Morn Even | Morn Even | Morn Even | Morn Even |
| Weight of Milk, 2nd day | ... | ... | ... | 20.8 20.5 | 26.0 26.0 | 26.0 24.6 | 23.4 24.2 |
| Total | ... | ... | ... | 21.9 22.3 | 29.9 25.8 | 27.0 24.6 | 24.8 24.6 |
| Average ... | ... | ... | ... | 42.7 42.8 | 55.9 51.8 | 53.0 49.2 | 48.2 48.8 |
| Percentage { Fat ... | ... | ... | ... | 21.3 21.4 | 27.9 25.9 | 26.5 24.6 | 24.1 24.4 |
| Composition of { Solids other than Fat | ... | ... | ... | 4.14 4.71 | 2.83 3.04 | 2.82 3.01 | 2.53 3.73 |
| the Milk. { Solids ... | ... | ... | ... | 9.72 9.55 | 9.41 8.92 | 8.88 8.99 | 9.65 9.33 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | 13.86 14.26 | 12.24 11.96 | 11.70 12.00 | 12.18 13.06 |
| Calculation of Points multiply by 20 | ... | ... | ... | .88 1.01 | .79 .79 | .72 .74 | .61 .91 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | 17.6 20.2 | 15.8 15.8 | 14.4 14.8 | 12.2 18.2 |
| Calculation of Points multiply by 4 ... | ... | ... | ... | 2.07 2.05 | 2.64 2.32 | 2.34 2.21 | 2.32 2.28 |
| Points { For time since Calving ... | ... | ... | ... | 8.28 8.20 | 10.56 9.28 | 9.36 8.84 | 9.28 9.12 |
| { For weight of Milk ... | ... | ... | ... | — | 4.0 | — | — |
| { For weight of Fat ... | ... | ... | ... | 42.7 | 53.8 | 51.1 | 48.5 |
| { For weight of Solids other than Fat | ... | ... | ... | 37.8 | 31.6 | 29.2 | 30.4 |
| Total ... | ... | ... | ... | 16.5 | 19.8 | 18.2 | 18.4 |
| Deductions ... | ... | ... | ... | 97.0 | 109.2 | 108.5 | 97.3 |
| Points gained | ... | ... | ... | — | 10.0 | 10.0 | 10.0 |
| Remarks and Awards... | ... | ... | ... | 97.0 | 99.2 | 88.5 | 87.3 |

CLASS 2.—SHORTHORN HEIFERS (NOT EXCEEDING THREE YEARS OLD).

| Number ... Name ... | ... | ... | ... | ... | ... | 22 Kingthorpe Barrington | 24 Natland Daisy. | 27 Roseblush 3rd. | 28 Bloom 17th. |
|--|-----|-----|-----|-----|-----|-----------------------------|----------------------|----------------------|-------------------|
| | | | | | | | | | |
| Born ... | ... | ... | ... | ... | ... | Dec. 6th, 1912. | Nov. 3, 1912. | April 13th, 1913. | Sept. 26th, 1912. |
| Number of Calves ... | ... | ... | ... | ... | ... | Oct. 5. | Oct. 1. | Aug. 14. | Aug. 29. |
| Last Calved ... | ... | ... | ... | ... | ... | 15 | 19 | 67 | 52 |
| Days since Calving ... | ... | ... | ... | ... | ... | | | | |
| Weight of Milk, 1st day | ... | ... | ... | ... | ... | Morn Even | Morn Even | Morn Even | Morn Even |
| Weight of Milk, 2nd day | ... | ... | ... | ... | ... | 18.2 16.0 | 18.1 14.5 | 14.4 12.5 | 20.5 17.8 |
| Total ... | ... | ... | ... | ... | ... | 18.5 16.4 | 17.1 15.7 | 13.8 13.1 | 20.7 16.1 |
| Average ... | ... | ... | ... | ... | ... | 36.7 32.4 | 35.2 30.2 | 28.2 25.6 | 41.2 33.9 |
| | ... | ... | ... | ... | ... | 18.3 16.2 | 17.6 15.1 | 14.1 12.8 | 20.6 16.9 |
| Percentage (Fat ...) | ... | ... | ... | ... | ... | 4.51 4.37 | 3.78 3.47 | 3.95 4.12 | 2.80 2.57 |
| Composition of (Solids other than Fat | ... | ... | ... | ... | ... | 9.93 9.83 | 9.32 9.41 | 9.45 9.48 | 9.12 9.35 |
| the Milk, (Solids | ... | ... | ... | ... | ... | 14.44 14.20 | 13.10 12.88 | 13.40 13.60 | 11.92 11.92 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | ... | ... | .83 .71 | .66 .52 | .56 .53 | .58 .43 |
| Calculation of Points multiply by 20 | ... | ... | ... | ... | ... | 16.6 14.2 | 13.2 10.4 | 11.2 10.6 | 11.6 8.6 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | ... | 1.84 1.6 | 1.64 1.42 | 1.33 1.22 | 1.90 1.58 |
| Calculation of Points multiply by 4 | ... | ... | ... | ... | ... | 7.36 6.40 | 6.56 5.68 | 5.32 4.88 | 7.60 6.32 |
| Points { For time since Calving For weight of Milk ... For weight of Fat ... For weight of Solids other than Fat | ... | ... | ... | ... | ... | — | — | 2.7 | 1.2 |
| | ... | ... | ... | ... | ... | 34.5 | 32.7 | 26.9 | 37.5 |
| | ... | ... | ... | ... | ... | 30.8 | 23.6 | 21.8 | 20.2 |
| | ... | ... | ... | ... | ... | 13.8 | 12.2 | 10.2 | 13.9 |
| Total ... | ... | ... | ... | ... | ... | 79.1 | 68.5 | 61.6 | 72.8 |
| Deductions ... | ... | ... | ... | ... | ... | — | — | — | 20.0 |
| Points gained | ... | ... | ... | ... | ... | 79.1 | 68.5 | 61.6 | 52.8 |
| Remarks and Awards ... | ... | ... | ... | ... | ... | 1st Prize. | 2nd Prize. | | |

SPECIAL NOTE.—The name of animal No. 32 in the Catalogue of 1914 gaining Reserve and given on page 165 in Journal, vol. 29, as "Lady Nottingham 21st" should read "Newland Rose 8th" owned by Mr. H. H. Owtram.

CLASS 3.—SHORTHORN COWS (NOT ELIGIBLE FOR CLASS 1).

| Number ... | ... | ... | ... | ... | 32 Liberty. | 34 Lizzie. | 35 Mary. | 36 Laneside Pearl. |
|---|-----|-----|-----|-----|--|-----------------|---------------|--|
| Name ... | ... | ... | ... | ... | 1909. | 1910. | Oct. 4, 1910. | About 6 years. |
| Born ... | ... | ... | ... | ... | Sept. 12, 38 | Sept. 10, 40 | Oct. 1, 19 | Sept. 30, 20 |
| Number of Calves ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Last Calved ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Days since Calving ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Weight of Milk, 1st day | ... | ... | ... | ... | Morn | Even | Morn | Even |
| Weight of Milk, 2nd day | ... | ... | ... | ... | 37.8 | 31.9 | 24.2 | 24.1 |
| Total ... | ... | ... | ... | ... | 34.4 | 31.8 | 25.2 | 20.0 |
| Average | ... | ... | ... | ... | 72.2 | 63.7 | 49.6 | 41.4 |
| ... | ... | ... | ... | ... | 36.1 | 31.8 | 24.8 | 20.7 |
| Percentage { Fat ... | ... | ... | ... | ... | 3.92 | 4.48 | 4.42 | 3.76 |
| Composition of { Solids other than Fat | ... | ... | ... | ... | 9.10 | 9.26 | 9.02 | 9.34 |
| the Milk. { Solids | ... | ... | ... | ... | 13.02 | 13.74 | 13.44 | 13.10 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | ... | 1.41 | 1.42 | 1.1 | .78 |
| Calculation of Points multiply by 20 | ... | ... | ... | ... | 28.2 | 28.4 | 22.0 | 15.6 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | 3.30 | 2.94 | 2.24 | 1.93 |
| Calculation of Points multiply by 4 | ... | ... | ... | ... | 13.20 | 11.76 | 8.96 | 7.72 |
| Points { For time since Calving | ... | ... | ... | ... | ... | ... | ... | ... |
| { For weight of Milk ... | ... | ... | ... | ... | 67.9 | 54.3 | 45.5 | 61.6 |
| { For weight of Fat ... | ... | ... | ... | ... | 56.6 | 60.8 | 37.6 | 51.4 |
| { For weight of Solids other than Fat | ... | ... | ... | ... | 25.0 | 19.3 | 16.7 | 23.2 |
| Total ... | ... | ... | ... | ... | 149.5 | 134.6 | 99.8 | 136.2 |
| Deductions | ... | ... | ... | ... | ... | ... | ... | ... |
| Points gained | ... | ... | ... | ... | 149.5 | 134.6 | 99.8 | 136.2 |
| Remarks and Awards ... | ... | ... | ... | ... | 1st Prize, Lord of Hagan's Cup, Barham Cup, Shire Cup, Spencer Cup. | 3rd Prize. | ... | 2nd Prize, Res. for Lord of Hagan's Cup, Res. for Barham Cup, Res. for Shire Cup. |

CLASS 3.—SHORTHORN COWS (NOT ELIGIBLE FOR CLASS 1)—Continued.

| Number ... Name ... | ... | ... | ... | 37 Laneside Jewel. | 38 White Socks. | 40 Model Lily 2nd. April 20, 1909. 5 Aug. 20. 61 | 41 Fillpai. Unknown. Sept. 18. 32 |
|---|-----|-----|-----|-----------------------|--------------------|---|---|
| Born ... | ... | ... | ... | About 6 years. | Sept. 13. 37 | | |
| Number of Calves ... | ... | ... | ... | Oct. 4. 16 | | | |
| Last Calved ... | ... | ... | ... | | | | |
| Days since Calving ... | ... | ... | ... | | | | |
| Weight of Milk, 1st day | ... | ... | ... | Morn Even | Morn Even | Morn Even | Morn Even |
| Weight of Milk, 2nd day | ... | ... | ... | 28-9 25-9 | 29-7 31-1 | 33-0 36-2 | 29-1 22-8 |
| Total | ... | ... | ... | 29-2 26-5 | 38-6 33-9 | 37-6 33-6 | 27-5 24-1 |
| Average | ... | ... | ... | 58-1 52-4 | 68-3 65-0 | 70-6 69-8 | 56-6 46-9 |
| | ... | ... | ... | 29-0 26-2 | 34-1 32-5 | 35-3 34-9 | 28-3 23-4 |
| Percentage (Fat ... | ... | ... | ... | 3-66 3-67 | 2-51 2-17 | 2-93 3-06 | 5-34 3-96 |
| Composition of Solids other than Fat | ... | ... | ... | 9-30 9-05 | 8-61 8-57 | 9-77 9-20 | 9-38 9-38 |
| the Milk. (Solids ... | ... | ... | ... | 12-96 12-72 | 11-12 10-74 | 12-70 12-26 | 14-72 13-34 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | 1-06 -96 | .85 .66 | 1-04 1-07 | 1-51 .83 |
| Calculation of Points multiply by 20 | ... | ... | ... | 21-2 19-2 | 17-0 13-2 | 20-8 21-4 | 30-2 18-6 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | 2-70 2-38 | 2-94 2-8 | 3-46 3-22 | 2-66 2-2 |
| Calculation of Points multiply by 4 | ... | ... | ... | 10-80 9-52 | 11-76 11-20 | 13-84 12-88 | 10-64 8-80 |
| Points { For time since Calving ... | ... | ... | ... | 55-2 | 66-6 | 2-1 | 51-7 |
| { For weight of Milk ... | ... | ... | ... | 40-4 | 30-2 | 70-2 | 48-8 |
| { For weight of Fat ... | ... | ... | ... | 20-3 | 23-0 | 26-7 | 19-4 |
| { For weight of Solids other than Fat | ... | ... | ... | Total | 119-8 | 141-2 | 119-9 |
| Deductions | ... | ... | ... | — | 20-0 | 10-0 | — |
| Points gained | ... | ... | ... | 115-9 | 99-8 | 131-2 | 119-9 |
| Remarks and Awards ... | ... | ... | ... | Commended. | | High Commendation. | Commended. |

CLASS 3.—SHORTHORN COWS (NOT ELIGIBLE FOR CLASS 1).—Continued.

| Number ... Name ... | ... | ... | ... | ... | 42 Daisy. | 44 Southfield Edna. | 47 Mary. | 49 Molly. |
|---|-----|-----|-----|-----|-----------------|------------------------|--------------------|-----------------|
| | | | | | | | | |
| Born ... | ... | ... | ... | ... | Unknown. | Unknown. | June 20, 1910. | About 6 yrs. |
| Number of Calves ... | ... | ... | ... | ... | Sept. 15, 35 | Oct. 2, 18 | March 3, 231 | Sept. 16, 34 |
| Last Calved ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Days since Calving ... | ... | ... | ... | ... | ... | ... | ... | ... |
| Weight of Milk, 1st day ... | ... | ... | ... | ... | Morn Even | Morn Even | Morn Even | Morn Even |
| Weight of Milk, 2nd day ... | ... | ... | ... | ... | 30.3 25.3 | 25.4 23.0 | 33.7 22.5 | 30.0 24.0 |
| Total ... | ... | ... | ... | ... | 29.3 29.4 | 25.4 22.8 | 31.0 20.9 | 31.0 30.5 |
| Average ... | ... | ... | ... | ... | 59.6 54.7 | 50.8 45.8 | 64.7 49.4 | 61.0 54.5 |
| Percentage { Fat ... | ... | ... | ... | ... | 29.8 27.3 | 25.4 22.9 | 32.3 24.7 | 30.5 27.2 |
| Composition of { Solids other than Fat | ... | ... | ... | ... | 3.55 3.79 | 2.91 3.88 | 3.86 3.52 | 2.03 2.40 |
| the Milk. { Solids ... | ... | ... | ... | ... | 9.27 9.07 | 9.35 9.34 | 8.62 8.94 | 9.55 9.32 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | ... | 12.82 12.86 | 12.26 13.22 | 12.00 12.46 | 11.58 11.72 |
| Calculation of Points multiply by 20 ... | ... | ... | ... | ... | 1.06 1.04 | .74 .89 | 1.08 .87 | .62 .65 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | 21.2 20.8 | 14.8 17.8 | 21.6 17.4 | 12.4 13.0 |
| Calculation of Points multiply by 4 ... | ... | ... | ... | ... | 2.62 2.48 | 2.38 2.14 | 2.78 2.21 | 2.90 2.54 |
| Points { For time since Calving ... | ... | ... | ... | ... | 10.48 9.92 | 9.52 8.56 | 11.12 8.84 | 11.60 10.16 |
| { For weight of Milk ... | ... | ... | ... | ... | ... | ... | 12.0 | ... |
| { For weight of Fat ... | ... | ... | ... | ... | 57.1 | 48.3 | 57.0 | 57.7 |
| { For weight of Solids other than Fat ... | ... | ... | ... | ... | 42.0 | 32.6 | 39.0 | 25.4 |
| Total ... | ... | ... | ... | ... | 20.4 | 14.1 | 20.0 | 21.8 |
| Deductions ... | ... | ... | ... | ... | 119.5 | 99.0 | 128.0 | 104.9 |
| Points gained ... | ... | ... | ... | ... | ... | 10.0 | ... | 20.0 |
| Remarks and Awards .. | ... | ... | ... | ... | 119.5 | 89.0 | 128.0 | 84.9 |
| | ... | ... | ... | ... | Commended. | | High Commendation. | |

CLASS 3.—SHORTHORN COWS (NOT ELIGIBLE FOR CLASS 1).—Continued.

| | | | | | |
|---|-----|-----|-----|-----|---------------------------|
| Number ... | ... | ... | ... | ... | 51 Silverton Verona 1. |
| Born ... | ... | ... | ... | ... | About 6 years. |
| Number of Calves | ... | ... | ... | ... | — |
| Last Calved ... | ... | ... | ... | ... | Sept. 28, |
| Days since Calving | ... | ... | ... | ... | 22 |
| Weight of Milk, 1st day | ... | ... | ... | ... | Morn Even |
| Weight of Milk, 2nd day | ... | ... | ... | ... | 20.8 28.7 |
| Total ... | ... | ... | ... | ... | 32.2 28.2 |
| Average ... | ... | ... | ... | ... | 62.0 56.9 |
| Percentage (Fat ... | ... | ... | ... | ... | 31.0 28.4 |
| Composition of { Solids other than Fat | ... | ... | ... | ... | 4.00 4.67 |
| the Milk. (Solids | ... | ... | ... | ... | 9.06 9.29 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | ... | 13.06 13.96 |
| Calculation of Points multiply by 20 | ... | ... | ... | ... | 1.24 1.33 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | 24.8 26.6 |
| Calculation of Points multiply by 4 | ... | ... | ... | ... | 2.72 2.64 |
| Points { For time since Calving | ... | ... | ... | ... | 10.88 10.56 |
| { For weight of Milk ... | ... | ... | ... | ... | — |
| { For weight of Fat ... | ... | ... | ... | ... | 59.4 |
| { For weight of Solids other than Fat | ... | ... | ... | ... | 51.4 |
| Total ... | ... | ... | ... | ... | 21.4 |
| Deductions ... | ... | ... | ... | ... | 132.2 |
| Points gained | ... | ... | ... | ... | — |
| Remarks and Awards ... | ... | ... | ... | ... | 132.2 |
| | ... | ... | ... | ... | Reserve and |
| | ... | ... | ... | ... | Rest, for Spearer Cup. |

CLASS 4.—SHORTHORN HEIFERS (NOT ELIGIBLE FOR CLASS 2).

| Number ... Name ... | ... | ... | ... | ... | ... | 58 Lady Crystal. | 60 Sally. |
|---|-----|-----|-----|-----|-----|----------------------|-----------------|
| | | | | | | Sept. 27, 1912. 2 | Sept. 20. 30 |
| Born ... | ... | ... | ... | ... | ... | Mar. 1913. | |
| Number of Calves ... | ... | ... | ... | ... | ... | Sept. 10. 40 | |
| Last Calved ... | ... | ... | ... | ... | ... | | |
| Days since Calving ... | ... | ... | ... | ... | ... | | |
| Weight of Milk, 1st day ... | ... | ... | ... | ... | ... | Morn Even | Morn Even |
| Weight of Milk, 2nd day ... | ... | ... | ... | ... | ... | 15.8 14.7 | 24.2 21.9 |
| Total ... | ... | ... | ... | ... | ... | 17.8 15.2 | 24.0 22.1 |
| Average ... | ... | ... | ... | ... | ... | 33.1 29.9 | 48.2 44.0 |
| Percentage { Fat ... | ... | ... | ... | ... | ... | 16.5 14.9 | 24.1 22.0 |
| Composition of { Solids other than Fat | ... | ... | ... | ... | ... | 2.39 3.02 | 3.67 4.61 |
| the Milk. | ... | ... | ... | ... | ... | 9.25 9.12 | 9.57 9.49 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | ... | ... | 11.64 12.14 | 13.24 14.10 |
| Calculation of Points multiply by 20 ... | ... | ... | ... | ... | ... | .39 .45 | .88 1.02 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | ... | 7.8 9.0 | 17.6 20.4 |
| Calculation of Points multiply by 4 ... | ... | ... | ... | ... | ... | 1.53 1.36 | 2.33 2.08 |
| Points { For time since Calving ... | ... | ... | ... | ... | ... | 6.12 5.44 | 9.32 8.32 |
| { For weight of Milk ... | ... | ... | ... | ... | ... | 31.4 | 46.1 |
| { For weight of Fat ... | ... | ... | ... | ... | ... | 16.8 | 38.0 |
| { For weight of Solids other than Fat ... | ... | ... | ... | ... | ... | 11.6 | 17.6 |
| Total ... | ... | ... | ... | ... | ... | 59.8 | 101.7 |
| Deductions ... | ... | ... | ... | ... | ... | 10.0 | — |
| Points gained ... | ... | ... | ... | ... | ... | 49.8 | 101.7 |
| Remarks and Awards ... | ... | ... | ... | ... | ... | | 1st Prize. |

CLASS 5.—LINCOLNSHIRE RED SHORTHORN COWS

| Number ... | ... | ... | ... | 61 Sherwood No. 26 | 62 Bendish Bess. | 65 Burton Ruby Spot 11. | 66 Burton Millicent. |
|---|-----|-----|-----|-----------------------|---------------------|----------------------------|-------------------------|
| Name ... | ... | ... | ... | June, 1908. | Mar. 18, 1911. | Oct. 3, 1911. | Mar., 1907. |
| Born ... | ... | ... | ... | Sept. 27. | Sept. 24. | Sept. 7. | Aug. 15. |
| Number of Calves ... | ... | ... | ... | 23 | 26 | 43 | 66 |
| Last Calved ... | ... | ... | ... | ... | ... | ... | ... |
| Days since Calving ... | ... | ... | ... | ... | ... | ... | ... |
| Weight of Milk, 1st day | ... | ... | ... | Morn Even | Morn Even | Morn Even | Morn Even |
| Weight of Milk, 2nd day | ... | ... | ... | 29.6 25.3 | 31.0 28.2 | 29.5 26.0 | 31.0 27.6 |
| Total | ... | ... | ... | 30.8 27.6 | 31.7 29.6 | 30.0 23.0 | 33.0 28.6 |
| Average | ... | ... | ... | 60.4 52.9 | 62.7 57.8 | 59.5 49.0 | 64.0 56.2 |
| Percentage { Fat ... | ... | ... | ... | 30.2 26.4 | 31.3 28.9 | 29.7 24.5 | 32.0 28.1 |
| Composition of { Solids other than Fat | ... | ... | ... | 2.96 2.88 | 2.44 2.41 | 3.02 3.91 | 2.93 3.05 |
| the Milk. { Solids ... | ... | ... | ... | 9.18 9.12 | 9.08 9.05 | 8.96 9.09 | 9.17 9.25 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | 12.48 12.00 | 11.52 11.46 | 11.98 13.00 | 12.10 12.30 |
| Calculation of Points multiply by 20 | ... | ... | ... | .89 .76 | .76 .7 | .99 .90 | .94 .86 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | 17.8 15.2 | 15.2 14.0 | 18.0 19.2 | 18.8 17.2 |
| Calculation of Points multiply by 4 | ... | ... | ... | 2.78 2.41 | 2.84 2.62 | 2.66 2.22 | 2.94 2.6 |
| Points { For time since Calving ... | ... | ... | ... | 11.12 9.64 | 11.36 10.48 | 10.64 8.88 | 11.76 10.40 |
| { For weight of Milk ... | ... | ... | ... | ... | ... | ... | ... |
| { For weight of Fat ... | ... | ... | ... | 56.6 | 60.2 | 54.2 | 2.6 |
| { For weight of Solids other than Fat | ... | ... | ... | 33.0 | 29.2 | 37.2 | 60.1 |
| Total | ... | ... | ... | 20.8 | 21.8 | 19.5 | 36.0 |
| Deductions | ... | ... | ... | 110.4 | 111.2 | 111.2 | 22.2 |
| Points gained | ... | ... | ... | 20.0 | 20.0 | — | 120.9 |
| Remarks and Awards ... | ... | ... | ... | 90.4 | 91.2 | 111.2 | 10.0 |
| | ... | ... | ... | | | | 110.9 |
| | ... | ... | ... | | | 1st Prize. | 2nd Prize. |

Class 5.—LINCOLNSHIRE RED SHORTHORN COWS—Continued.

| Number ... Name ... | ... | ... | ... | ... | 67 Burton Lovely. Mar., 1909. — May 27. 146 | 68 Burton Queen. Sept., 1910. — Sept. 20. 30 |
|---|-----|-----|-----|-----|--|---|
| | | | | | | |
| Born ... | ... | ... | ... | ... | | |
| Number of Calves ... | ... | ... | ... | ... | | |
| Last Calved ... | ... | ... | ... | ... | | |
| Days since Calving ... | ... | ... | ... | ... | | |
| Weight of Milk, 1st day | ... | ... | ... | ... | Morn Even | Morn Even |
| Weight of Milk, 2nd day | ... | ... | ... | ... | 25·3 21·7 | 25·2 17·9 |
| Total ... | ... | ... | ... | ... | 27·0 20·3 | 28·1 22·0 |
| Average | ... | ... | ... | ... | 52·3 42·0 | 53·3 39·9 |
| | ... | ... | ... | ... | 26·1 21·0 | 26·6 19·9 |
| Percentage | ... | ... | ... | ... | | |
| Composition of { Fat ... | ... | ... | ... | ... | 28·9 27·2 | 37·9 25·6 |
| the Milk. { Solids other than Fat | ... | ... | ... | ... | 8·89 9·18 | 9·37 9·40 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | ... | 11·78 11·90 | 13·16 11·96 |
| Calculation of Points multiply by 20 | ... | ... | ... | ... | 78 57 | 101 51 |
| | ... | ... | ... | ... | 15·2 11·4 | 20·2 10·2 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | | |
| Calculation of Points multiply by 4 ... | ... | ... | ... | ... | 2·82 1·93 | 2·50 1·87 |
| | ... | ... | ... | ... | 9·28 7·72 | 10·00 7·48 |
| Points { For time since Calving | ... | ... | ... | ... | 10·6 | — |
| { For weight of Milk ... | ... | ... | ... | ... | 47·1 | 46·5 |
| { For weight of Fat ... | ... | ... | ... | ... | 26·6 | 30·4 |
| { For weight of Solids other than Fat | ... | ... | ... | ... | 17·0 | 17·5 |
| Total ... | ... | ... | ... | ... | 101·3 | 94·4 |
| Deductions | ... | ... | ... | ... | 20·0 | 10·0 |
| Points gained | ... | ... | ... | ... | 81·3 | 84·4 |
| Remarks and Awards ... | ... | ... | ... | ... | | |

CLASS 6.—LINCOLNSHIRE RED SHORTHORN HEIFERS (NOT EXCEEDING THREE YEARS).

| Number ... | ... | ... | ... | 69 | 79 | 71 | 73 |
|---|-----|-----|-----|-----------------|-------------------|-----------------------|-------------------|
| Name ... | ... | ... | ... | Barton Vic 9th. | Barton Ruby 18th. | Barton Buttercup 5th. | Bendish Iris 2nd. |
| Born ... | ... | ... | ... | Nov. 16, 1912. | Sept. 15, 1912. | Sept. 16, 1912. | Dec. 14, 1912. |
| Number of Calves ... | ... | ... | ... | Sept. 3. | Sept. 16 | Oct. 1. | Aug. 17. |
| Last Calved ... | ... | ... | ... | 47 | 34 | 19 | 04 |
| Days since Calving ... | ... | ... | ... | | | | |
| Weight of Milk, 1st day ... | ... | ... | ... | Morn Even | Morn Even | Morn Even | Morn Even |
| Weight of Milk, 2nd day ... | ... | ... | ... | 16.0 14.0 | 23.5 20.2 | 19.6 17.8 | 13.4 13.0 |
| Total ... | ... | ... | ... | 17.0 14.6 | 24.4 21.2 | 20.5 18.2 | 16.0 14.6 |
| Average ... | ... | ... | ... | 33.0 28.6 | 47.9 41.4 | 40.1 36.0 | 29.4 27.6 |
| Percentage { Fat ... | ... | ... | ... | 16.5 14.3 | 23.9 20.7 | 20.0 18.0 | 14.7 13.8 |
| Composition of { Solids other than Fat | ... | ... | ... | 2.60 2.82 | 2.93 3.50 | 3.03 3.38 | 2.15 2.68 |
| the Milk, { Solids ... | ... | ... | ... | 9.36 9.40 | 9.47 9.31 | 9.45 9.82 | 8.99 8.92 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | 11.96 12.22 | 12.40 12.90 | 12.48 13.20 | 11.14 11.60 |
| Calculation of Points multiply by 20 | ... | ... | ... | .43 .40 | .7 .74 | .61 .61 | .31 .37 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | 8.6 8.0 | 14.0 14.8 | 12.2 12.2 | 6.2 7.4 |
| Calculation of Points multiply by 4 | ... | ... | ... | 1.55 1.35 | 2.26 1.93 | 1.9 1.77 | 1.32 1.23 |
| Points { For time since Calving | ... | ... | ... | 6.20 5.40 | 9.04 7.72 | 7.60 7.08 | 5.28 4.92 |
| { For weight of Milk ... | ... | ... | ... | .7 | | | 2.4 |
| { For weight of Fat ... | ... | ... | ... | 30.8 | 44.6 | 38.0 | 28.5 |
| { For weight of Solids other than Fat | ... | ... | ... | 16.6 | 28.8 | 24.4 | 13.6 |
| Total ... | ... | ... | ... | 11.6 | 16.8 | 14.7 | 10.2 |
| Deductions ... | ... | ... | ... | 59.7 | 10.2 | 77.1 | 54.7 |
| Points gained | ... | ... | ... | 20.0 | 10.0 | — | 20.0 |
| Remarks and Awards ... | ... | ... | ... | 39.7 | 80.2 | 77.1 | 34.7 |
| | ... | ... | ... | | 1st Prize. | 2nd Prize. | |

CLASS 7.—JERSEY COWS.

| Number ... Name ... | ... | ... | ... | ... | ... | 74 My Pallas. | 75 Marcella. | 77 Victoria. | 78 Satin 2nd. |
|---|-----|-----|-----|-----|-----|---------------------------------------|--|--|--|
| | | | | | | Sept. 22, 1910. — July 4 108 | April 25, 1910. — April 29. 174 | April 18, 1908. — July 20. 92 | Feb. 28, 1912. — Sept. 12. 38 |
| Born ... | ... | ... | ... | ... | ... | 21-7 18-2 | Morn Even 22-1 19-7 | Morn Even 11-7 9-9 | Morn Even 12-3 12-5 |
| Number of Calves ... | ... | ... | ... | ... | ... | 21-0 20-0 | 22-3 19-6 | 11-6 8-5 | 13-3 11-7 |
| Last Calved ... | ... | ... | ... | ... | ... | 42-7 38-2 | 44-4 39-3 | 23-3 18-4 | 25-8 24-2 |
| Days since Calving ... | ... | ... | ... | ... | ... | 21-3 19-1 | 22-2 19-6 | 11-6 9-2 | 12-9 12-1 |
| Weight of Milk, 1st day ... | ... | ... | ... | ... | ... | 4-02 5-08 | 3-86 4-31 | 4-23 4-18 | 3-29 3-04 |
| Weight of Milk, 2nd day ... | ... | ... | ... | ... | ... | 9-12 9-40 | 9-38 9-45 | 9-23 9-22 | 9-57 9-74 |
| Total ... | ... | ... | ... | ... | ... | 13-14 14-48 | 13-24 13-76 | 13-46 13-40 | 12-86 13-38 |
| Average ... | ... | ... | ... | ... | ... | .85 .97 | .85 .84 | .49 .38 | .42 .44 |
| Percentage { Fat ... Composition of { Solids other than Fat the Milk. { Solids ... | ... | ... | ... | ... | ... | 17-0 19-4 | 17-0 16-8 | 9-8 7-6 | 8-4 8-8 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | ... | ... | 1-95 1-8 | 2-08 1-85 | 1-07 .83 | 1-24 1-18 |
| Calculation of Points multiply by 20 ... | ... | ... | ... | ... | ... | 7-8 7-2 | 8-32 7-4 | 4-23 3-32 | 4-96 4-72 |
| Actual weight of Solids other than Fat, in lbs. ... | ... | ... | ... | ... | ... | 6-8 | 12-0 | 5-2 | — |
| Calculation of Points multiply by 4 ... | ... | ... | ... | ... | ... | 40-4 | 41-8 | 20-8 | 25-0 |
| Points { For time since Calving ... For weight of Milk ... For weight of Fat ... For weight of Solids other than Fat ... | ... | ... | ... | ... | ... | 36-4 | 33-8 | 17-4 | 17-2 |
| Total ... | ... | ... | ... | ... | ... | 15-0 | 15-7 | 7-6 | 9-7 |
| Deductions ... | ... | ... | ... | ... | ... | 98-6 | 103-3 | 51-0 | 51-9 |
| Points gained ... | ... | ... | ... | ... | ... | — | — | — | — |
| Remarks and Awards ... | ... | ... | ... | ... | ... | 98-6 | 103-3 | 51-0 | 51-9 |
| | ... | ... | ... | ... | ... | 3rd Prize. | 2nd Prize. | | |

CLASS 7.—JERSEY COWS—Continued.

| Number ... Name ... | ... | ... | ... | ... | 79 Parklands Beauty. Dec. 4, 1911. July 12, 100 | 80 Devon Cream. June 3, 1903. Sept. 20, 30 | 81 Speckled Hipec Yoson. Feb. 7, 1910. Aug. 4, 77 | 83 Miriam's Golden Maid July 1, 1911. Sept. 25, 25 |
|---|-----|-----|-----|-----|---|--|---|--|
| | | | | | | | | |
| Born ... | ... | ... | ... | ... | | | | |
| Number of Calves ... | ... | ... | ... | ... | | | | |
| Last Calved ... | ... | ... | ... | ... | | | | |
| Days since Calving ... | ... | ... | ... | ... | | | | |
| Weight of Milk, 1st day | ... | ... | ... | ... | Morn Even | Morn Even | Morn Even | Morn Even |
| Weight of Milk, 2nd day | ... | ... | ... | ... | 5.1 4.9 | 17.3 15.3 | 14.6 13.7 | 13.8 11.9 |
| Total | ... | ... | ... | ... | 5.2 5.2 | 17.3 15.3 | 14.3 12.1 | 14.2 13.3 |
| Average ... | ... | ... | ... | ... | 10.3 10.1 | 34.6 30.6 | 28.9 25.8 | 28.0 25.2 |
| Percentage { Fat ... | ... | ... | ... | ... | 5.1 5.0 | 17.3 15.3 | 14.4 12.9 | 14.0 12.6 |
| Composition of { Solids other than Fat | ... | ... | ... | ... | 7.01 6.17 | 3.58 4.73 | 4.47 4.91 | 5.41 5.40 |
| the Milk. { Solids | ... | ... | ... | ... | 10.15 10.29 | 9.46 8.91 | 9.25 9.17 | 9.57 9.74 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | ... | 17.16 16.46 | 13.04 13.64 | 13.72 14.08 | 14.98 15.14 |
| Calculation of Points multiply by 20 | ... | ... | ... | ... | .36 .31 | .62 .72 | .64 .63 | .76 .68 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | 7.2 6.2 | 12.4 14.4 | 12.8 12.6 | 15.2 13.6 |
| Calculation of Points multiply by 4 | ... | ... | ... | ... | .59 .51 | 1.64 1.36 | 1.33 1.18 | 1.34 1.23 |
| Points { For time since Calving | ... | ... | ... | ... | 2.36 2.04 | 6.56 5.44 | 5.32 4.72 | 5.36 4.92 |
| For weight of Milk ... | ... | ... | ... | ... | 6.0 | — | 3.7 | — |
| For weight of Fat ... | ... | ... | ... | ... | 10.1 | 32.6 | 27.3 | 26.6 |
| For weight of Solids other than Fat | ... | ... | ... | ... | 4.4 | 26.8 | 23.4 | 28.8 |
| Total ... | ... | ... | ... | ... | 33.9 | 12.0 | 10.0 | 10.3 |
| Deductions | ... | ... | ... | ... | — | 71.4 | 66.4 | 65.7 |
| Points gained | ... | ... | ... | ... | 33.9 | — | — | — |
| Remarks and Awards ... | ... | ... | ... | ... | | 71.4 | 66.4 | 65.7 |

CLASS 10.—GUERNSEY COWS.

| Number Name | ... | ... | ... | ... | ... | 100 Treats 3rd. | 101 Donnington Jane. | 102 (Dated Pay of the M.M.) | 103 Muriel 34th. |
|---|-----|-----|-----|-----|-----|--------------------|-------------------------|--------------------------------|---------------------|
| | | | | | | | | | |
| Born | ... | ... | ... | ... | ... | Jan. 14, 1909. | Nov. 14, 1909. | June 2, 1908. | Oct. 12, 1910. |
| Number of Calves | ... | ... | ... | ... | ... | 5 | — | — | — |
| Last Calved | ... | ... | ... | ... | ... | May 24. | April 17. | Sept. 30. | June 14. |
| Days since Calving | ... | ... | ... | ... | ... | 149 | 186 | 20 | 128 |
| Weight of Milk, 1st day | ... | ... | ... | ... | ... | Morn Even | Morn Even | Morn Even | Morn Even |
| Weight of Milk, 2nd day | ... | ... | ... | ... | ... | 19.3 16.5 | 17.1 12.0 | 20.5 16.4 | 15.8 13.2 |
| Total | ... | ... | ... | ... | ... | 19.6 16.6 | 15.4 12.2 | 19.6 17.1 | 15.7 14.0 |
| Average | ... | ... | ... | ... | ... | 38.9 33.1 | 32.5 24.2 | 40.1 33.5 | 31.5 27.2 |
| Percentage { Fat ... | ... | ... | ... | ... | ... | 19.4 16.5 | 16.2 12.1 | 20.0 16.7 | 15.7 13.6 |
| Composition of { Solids other than Fat | ... | ... | ... | ... | ... | 4.92 5.02 | 4.90 5.32 | 3.51 3.53 | 5.20 5.20 |
| the Milk { Solids | ... | ... | ... | ... | ... | 10.04 9.82 | 9.54 9.38 | 9.15 9.13 | 9.30 9.46 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | ... | ... | 14.96 14.84 | 14.44 14.70 | 12.66 12.66 | 14.50 14.66 |
| Calculation of Points multiply by 20 | ... | ... | ... | ... | ... | .95 .83 | .79 .64 | .7 .59 | .81 .71 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | ... | 19.0 16.6 | 15.8 12.8 | 14.0 11.8 | 16.2 14.2 |
| Calculation of Points, multiply by 4 | ... | ... | ... | ... | ... | 1.95 1.62 | 1.54 1.13 | 1.83 1.53 | 1.46 1.28 |
| Points { For time since Calving | ... | ... | ... | ... | ... | 7.80 6.48 | 6.16 4.52 | 7.32 6.12 | 5.84 5.12 |
| { For weight of Milk | ... | ... | ... | ... | ... | 10.9 | 12.0 | — | 8.8 |
| { For weight of Fat | ... | ... | ... | ... | ... | 35.9 | 28.3 | 36.7 | 29.3 |
| { For weight of Solids other than Fat | ... | ... | ... | ... | ... | 35.6 | 28.6 | 25.8 | 30.4 |
| Total | ... | ... | ... | ... | ... | 14.3 | 10.7 | 13.4 | 11.0 |
| Deductions | ... | ... | ... | ... | ... | 96.7 | 79.6 | 75.9 | 79.5 |
| Points gained | ... | ... | ... | ... | ... | — | — | — | — |
| Remarks and Awards | ... | ... | ... | ... | ... | 96.7 | 79.6 | 75.9 | 79.5 |
| | ... | ... | ... | ... | ... | 1st Prize. | | | |

CLASS 10.—GUERNSEY COWS—Continued.

| Number ... | ... | ... | ... | 104 Rosey 11th . | 105 Donnington Juno. | 106 Nellie of the Vrangue. | 107 Susan of Stagenhoe. |
|---|-----|-----|-----|---------------------|-------------------------|-------------------------------|----------------------------|
| Name ... | ... | ... | ... | July 13, 1907. | Oct. 8, 1909. | Sept. 15, 1906. | 8½ years. |
| Born ... | ... | ... | ... | ... | ... | ... | Sept. 30. |
| Number of Calves ... | ... | ... | ... | July 18. | July 8. | July 10. | 20 |
| Last Calved ... | ... | ... | ... | 94 | 104 | 102 | |
| Days since Calving ... | ... | ... | ... | | | | |
| Weight of Milk, 1st day | ... | ... | ... | Morn Even | Morn Even | Morn Even | Morn Even |
| Weight of Milk, 2nd day | ... | ... | ... | 17.1 13.7 | 20.8 16.7 | 18.3 13.6 | 17.0 15.0 |
| Total | ... | ... | ... | 16.8 13.2 | 20.4 18.4 | 19.2 15.1 | 18.8 17.1 |
| Average ... | ... | ... | ... | 33.9 26.9 | 41.2 35.1 | 37.5 28.7 | 35.8 32.1 |
| Percentage (Fat ... | ... | ... | ... | 16.9 13.4 | 20.6 17.5 | 18.7 14.3 | 17.9 16.0 |
| Composition of { Solids other than Fat | ... | ... | ... | 4.83 5.06 | 4.52 4.25 | 3.92 4.38 | 4.00 4.56 |
| the Milk. { Solids | ... | ... | ... | 9.85 9.50 | 9.54 9.59 | 9.60 9.86 | 9.02 9.18 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | 14.68 14.56 | 14.06 13.84 | 13.52 14.24 | 13.02 13.74 |
| Calculation of Points multiply by 20 | ... | ... | ... | .81 .68 | .93 .75 | .73 .63 | .72 .73 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | 16.2 13.6 | 18.6 15.0 | 14.6 12.6 | 14.4 14.6 |
| Calculation of Points multiply by 4 | ... | ... | ... | 1.66 1.27 | 1.96 1.68 | 1.8 1.4 | 1.62 1.47 |
| Points { For time since Calving | ... | ... | ... | 6.64 5.08 | 7.84 6.72 | 7.2 5.6 | 6.48 5.88 |
| { For weight of Milk | ... | ... | ... | 5.4 | 6.4 | 6.2 | — |
| { For weight of Fat | ... | ... | ... | 30.3 | 38.1 | 33.0 | 33.9 |
| { For weight of Solids other than Fat | ... | ... | ... | 29.8 | 33.6 | 27.2 | 29.0 |
| Total | ... | ... | ... | 11.7 | 14.6 | 12.8 | 12.4 |
| Deductions | ... | ... | ... | 77.2 | 92.7 | 79.2 | 75.3 |
| Points gained | ... | ... | ... | 77.2 | 92.7 | 79.2 | 75.3 |
| Remarks and Awards ... | ... | ... | ... | 2nd Prize. | | | |

CLASS 13.—RED POLL HEIFERS (NOT EXCEEDING THREE YEARS).

| Number ... | ... | ... | ... | 121 Sudbourne Best Choice | 122 Sudbourne Adela. | 126 Ashmoor Sulky. | 127 Ashmoor Flat. |
|---|-----|-----|-----|------------------------------|--|-----------------------|----------------------|
| Name ... | ... | ... | ... | Sept. 18, 1912. | May 22, 1913. | Feb. 16, 1913. | Feb. 6, 1913. |
| Born ... | ... | ... | ... | 1 | — | — | — |
| Number of Calves ... | ... | ... | ... | Aug. 23. | Sept. 15. | Sept. 11. | Oct. 3. |
| Last Calved ... | ... | ... | ... | 58 | 35 | 39 | 17 |
| Days since Calving ... | ... | ... | ... | ... | ... | ... | ... |
| Weight of Milk, 1st day | ... | ... | ... | Morn | Morn | Morn | Morn |
| Weight of Milk, 2nd day | ... | ... | ... | Even | Even | Even | Even |
| Total | ... | ... | ... | 17.6 15.6 | 21.6 22.3 | 11.5 16.1 | 15.3 15.1 |
| Average | ... | ... | ... | 17.9 14.1 | 23.7 22.3 | 14.1 12.9 | 15.5 14.9 |
| ... | ... | ... | ... | 35.5 29.7 | 45.3 44.6 | 25.6 29.0 | 30.8 30.0 |
| ... | ... | ... | ... | 17.7 14.8 | 22.6 22.3 | 12.8 14.5 | 15.4 15.0 |
| Percentage (Fat ...) | ... | ... | ... | 4.23 4.56 | 2.94 3.22 | 2.93 2.86 | 3.63 4.75 |
| Composition of Solids other than Fat | ... | ... | ... | 9.73 9.48 | 9.60 9.30 | 9.99 9.48 | 9.61 9.39 |
| the Milk. (Solids ...) | ... | ... | ... | 13.96 14.04 | 12.54 12.52 | 12.92 12.34 | 13.24 14.14 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | .75 .66 | .86 .72 | .37 .41 | .56 .71 |
| Calculation of Points multiply by 20 | ... | ... | ... | 15.0 13.2 | 13.2 14.4 | 7.4 8.2 | 11.2 14.2 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | 1.72 1.4 | 2.16 2.08 | 1.28 1.37 | 1.48 1.41 |
| Calculation of Points multiply by 4 | ... | ... | ... | 6.88 5.6 | 8.64 8.32 | 5.12 5.48 | 5.92 5.64 |
| Points { For time since Calving ... | ... | ... | ... | 1.8 | — | — | — |
| { For weight of Milk ... | ... | ... | ... | 32.5 | 44.9 | 27.3 | 30.4 |
| { For weight of Fat ... | ... | ... | ... | 28.2 | 27.6 | 15.6 | 25.4 |
| { For weight of Solids other than Fat | ... | ... | ... | 12.5 | 17.0 | 10.6 | 11.6 |
| Total ... | ... | ... | ... | 75.0 | 89.5 | 53.5 | 67.4 |
| Deductions ... | ... | ... | ... | — | 10.0 | 20.0 | — |
| Points gained | ... | ... | ... | 75.0 | 79.5 | 33.5 | 67.4 |
| Remarks and Awards ... | ... | ... | ... | 3rd Prize. | 2nd Prize and Red Poll Cattle Society's Prize. | — | Reserve. |

CLASS 13.—RED POLL HEIFERS (NOT EXCEEDING THREE YEARS)—Continued.

| Number ... Name | ... | ... | ... | ... | ... | 128 Harcfield Princess A. Jan. 22, 1913. Sept. 8. 42 | 129 Brightwell Queen. Nov. 15, 1912. Aug. 24. 57 | 130 Brightwell Clinker. Jan. 1, 1913. Sept. 13. 37 |
|---|-----|-----|-----|-----|-----|--|--|--|
| | | | | | | Morn | Morn | Morn |
| Born | ... | ... | ... | ... | ... | Even | Even | Even |
| Number of Calves | ... | ... | ... | ... | ... | 18.9 | 17.2 | 20.0 |
| Last Calved | ... | ... | ... | ... | ... | 17.1 | 15.5 | 17.8 |
| Days since Calving | ... | ... | ... | ... | ... | 21.2 | 13.5 | 21.0 |
| | ... | ... | ... | ... | ... | 16.6 | 12.7 | 17.3 |
| | ... | ... | ... | ... | ... | 40.1 | 28.2 | 41.0 |
| | ... | ... | ... | ... | ... | 33.7 | 14.1 | 35.1 |
| | ... | ... | ... | ... | ... | 20.0 | 15.3 | 20.5 |
| | ... | ... | ... | ... | ... | 16.8 | 14.1 | 17.5 |
| Weight of Milk, 1st day | ... | ... | ... | ... | ... | 2.95 | 3.18 | 3.75 |
| Weight of Milk, 2nd day | ... | ... | ... | ... | ... | 3.45 | 3.25 | 3.98 |
| Total | ... | ... | ... | ... | ... | 9.11 | 9.62 | 9.71 |
| Average | ... | ... | ... | ... | ... | 9.05 | 9.39 | 9.54 |
| Percentage of Fat ... | ... | ... | ... | ... | ... | 12.06 | 12.64 | 13.46 |
| Composition of Solids other than Fat | ... | ... | ... | ... | ... | .59 | .46 | .77 |
| the Milk. | ... | ... | ... | ... | ... | .58 | .46 | .77 |
| Actual weight of Fat, in lbs. | ... | ... | ... | ... | ... | 11.8 | 9.8 | 15.4 |
| Calculation of Points multiply by 20 | ... | ... | ... | ... | ... | 11.0 | 9.2 | 14.0 |
| | ... | ... | ... | ... | ... | 1.82 | 1.32 | 2.0 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | ... | 1.52 | 1.32 | 1.67 |
| Calculation of Points multiply by 4 | ... | ... | ... | ... | ... | 7.28 | 5.28 | 8.0 |
| | ... | ... | ... | ... | ... | 6.08 | 5.28 | 6.68 |
| Points | ... | ... | ... | ... | ... | .2 | 1.7 | — |
| { For time since Calving | ... | ... | ... | ... | ... | 36.8 | 23.4 | 38.0 |
| { For weight of Milk | ... | ... | ... | ... | ... | 23.4 | 19.0 | 29.4 |
| { For weight of Fat | ... | ... | ... | ... | ... | 13.4 | 11.2 | 14.7 |
| { For weight of Solids other than Fat | ... | ... | ... | ... | ... | 73.8 | 61.3 | 82.1 |
| Total | ... | ... | ... | ... | ... | 10.0 | — | — |
| Deductions | ... | ... | ... | ... | ... | 63.8 | 61.3 | 82.1 |
| Points gained | ... | ... | ... | ... | ... | 63.8 | 61.3 | 82.1 |
| Remarks and Awards | ... | ... | ... | ... | ... | Commendation. | Commendation. | 1st Prize. Reserve for Red Poll Cattle Society's Prize. |

CLASS 15.—SOUTH DEVON COWS.

| Number ... Name ... | ... | ... | ... | ... | ... | 131 Mayflower 28th. Nov. 10, 1904. 6 Sept. 11. 39 | 132 Helwill Hinda. April, 1910. — Aug. 22. 59 | 134 Butterfly 9th. June 3, 1911. 2 Sept. 20. 30 |
|---|-----|-----|-----|-----|-----|--|--|--|
| | | | | | | Morn Even | Morn Even | Morn Even |
| Born ... | ... | ... | ... | ... | ... | 27.3 25.8 | 17.6 12.6 | 25.1 21.1 |
| Number of Calves ... | ... | ... | ... | ... | ... | 23.6 18.0 | 14.1 11.1 | 25.5 22.0 |
| Last Calved ... | ... | ... | ... | ... | ... | 50.9 43.8 | 31.7 23.7 | 50.6 43.1 |
| Days since Calving ... | ... | ... | ... | ... | ... | 25.4 21.9 | 15.8 11.8 | 25.3 21.5 |
| Weight of Milk, 1st day | ... | ... | ... | ... | ... | 3.43 3.80 | 2.85 3.34 | 3.23 3.67 |
| Weight of Milk, 2nd day | ... | ... | ... | ... | ... | 9.55 9.28 | 8.95 8.66 | 9.37 9.25 |
| Total | ... | ... | ... | ... | ... | 12.98 13.08 | 11.80 12.00 | 12.60 12.92 |
| Average | ... | ... | ... | ... | ... | .87 .83 | .45 .39 | .82 .79 |
| Percentage (Fat ... | ... | ... | ... | ... | ... | 17.4 16.6 | 9.0 7.8 | 16.4 15.8 |
| Composition of { Solids other than Fat | ... | ... | ... | ... | ... | 2.44 2.04 | 1.42 1.02 | 2.38 2.0 |
| the Milk. { Solids | ... | ... | ... | ... | ... | 9.76 8.16 | 5.62 4.08 | 9.52 8.0 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | ... | ... | — | 1.9 | — |
| Calculation of Points multiply by 20 | ... | ... | ... | ... | ... | 47.3 | 27.6 | 46.8 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | ... | 34.0 | 16.8 | 32.2 |
| Calculation of Points multiply by 4 | ... | ... | ... | ... | ... | 17.9 | 9.8 | 17.5 |
| Points { For time since Calving | ... | ... | ... | ... | ... | 99.2 | 56.1 | 96.5 |
| { For weight of Milk | ... | ... | ... | ... | ... | — | 10.0 | — |
| { For weight of Fat | ... | ... | ... | ... | ... | 99.2 | 46.1 | 96.5 |
| { For weight of Solids other than Fat | ... | ... | ... | ... | ... | — | — | — |
| Total ... | ... | ... | ... | ... | ... | 99.2 | — | — |
| Deductions ... | ... | ... | ... | ... | ... | — | — | — |
| Points gained | ... | ... | ... | ... | ... | — | — | — |
| Remarks and Awards ... | ... | ... | ... | ... | ... | — | — | — |

CLASS 17.—DEXTER COWS.

| Number | ... | ... | ... | ... | ... |
|---|-----|-----|-----|-----|-----|
| Name | ... | ... | ... | ... | ... |
| Born | ... | ... | ... | ... | ... |
| Number of Calves | ... | ... | ... | ... | ... |
| Last Calved | ... | ... | ... | ... | ... |
| Days since Calving | ... | ... | ... | ... | ... |
| Weight of Milk, 1st day | ... | ... | ... | ... | ... |
| Weight of Milk, 2nd day | ... | ... | ... | ... | ... |
| Total | ... | ... | ... | ... | ... |
| Average | ... | ... | ... | ... | ... |
| Percentage { Fat ... Composition of Solids other than Fat the Milk. Solids | ... | ... | ... | ... | ... |
| Actual weight of Fat, in lbs. | ... | ... | ... | ... | ... |
| Calculation of Points multiply by 20 | ... | ... | ... | ... | ... |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | ... |
| Calculation of Points multiply by 4 | ... | ... | ... | ... | ... |
| { For time since Calving Points { For weight of Milk ... For weight of Fat ... For weight of Solids other than Fat | ... | ... | ... | ... | ... |
| Total | ... | ... | ... | ... | ... |
| Deductions | ... | ... | ... | ... | ... |
| Points gained | ... | ... | ... | ... | ... |
| Remarks and Awards | ... | ... | ... | ... | ... |

CLASS 18.—BRITISH HOLSTEIN COWS—Continued.

| Number ... | ... | ... | ... | 146 | 147 | 149 |
|---|-----|-----|-----|----------------|----------------|----------------------|
| Name ... | ... | ... | ... | Park Butteaup. | Hedgee Flower. | Toddington Princess. |
| Born ... | ... | ... | ... | 1905. | June 27, 1909. | Unknown. |
| Last Calved ... | ... | ... | ... | May 12. | Oct. 3. | Aug. 17. |
| Days since Calving ... | ... | ... | ... | 161 | 17 | 64 |
| Weight of Milk, 1st day | ... | ... | ... | Morn | Morn | Morn |
| Weight of Milk, 2nd day | ... | ... | ... | Even | Even | Even |
| Total ... | ... | ... | ... | 24.9 18.5 | 32.6 30.5 | 36.2 34.9 |
| Average | ... | ... | ... | 23.8 18.4 | 29.0 30.5 | 36.8 34.1 |
| Percentage (Fat ... | ... | ... | ... | 48.7 36.9 | 61.6 61.0 | 73.0 69.0 |
| Composition of { Solids other than Fat | ... | ... | ... | 24.3 18.4 | 30.8 30.5 | 36.5 31.5 |
| the Milk. { Solids | ... | ... | ... | 3.36 3.77 | 2.94 4.16 | 2.35 2.76 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | 8.98 9.07 | 8.58 8.94 | 8.69 8.54 |
| Calculation of Points multiply by 20 | ... | ... | ... | 12.34 12.84 | 11.52 13.10 | 11.04 11.30 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | .82 .69 | .91 1.27 | .86 .95 |
| Calculation of Points multiply by 4 ... | ... | ... | ... | 16.4 13.8 | 18.2 25.4 | 17.2 19.0 |
| For time since Calving | ... | ... | ... | 2.18 1.66 | 2.64 2.72 | 3.18 2.95 |
| For weight of Milk ... | ... | ... | ... | 8.72 6.04 | 10.56 10.88 | 12.72 11.8 |
| For weight of Fat ... | ... | ... | ... | 12.0 | — | 2.4 |
| For weight of Solids other than Fat | ... | ... | ... | 42.7 | 61.3 | 71.0 |
| Total | ... | ... | ... | 30.2 | 43.6 | 36.2 |
| Deductions | ... | ... | ... | 15.4 | 21.4 | 24.5 |
| Points gained | ... | ... | ... | 100.3 | 126.3 | 134.1 |
| Remarks and Awards ... | ... | ... | ... | — | 10.0 | 20.0 |
| | ... | ... | ... | 100.3 | 116.3 | 114.1 |
| | ... | ... | ... | | 1st Prize. | 2nd Prize. |

CLASS 24.—GOATS.

| Number Name | ... | ... | ... | ... | 206 Tremeda Blue Bell. 1910. 2 Feb. 5. 257 | 207 Halton Hairbell. Jan. 22, 1912. — April 6. 197 | 208 Leazes Lady Fortune. Mar. 21, 1913. — May 1. 172 | 210 Pychley Belle. May 18, 1913. 2 May 15. 158 |
|---|-----|-----|-----|-----|---|---|---|---|
| Born | ... | ... | ... | ... | Morn | Morn | Morn | Morn |
| Number of Kids | ... | ... | ... | ... | Even | Even | Even | Even |
| Last Kided | ... | ... | ... | ... | 3.1 | 2.9 | 2.4 | 4.0 |
| Days since Kidding | ... | ... | ... | ... | 2.7 | 2.4 | 2.1 | 3.2 |
| Weight of Milk, 1st day | ... | ... | ... | ... | 2.6 | 2.5 | 2.2 | 4.1 |
| Weight of Milk, 2nd day | ... | ... | ... | ... | 6.3 | 5.9 | 4.3 | 8.1 |
| Total | ... | ... | ... | ... | 5.3 | 4.9 | 2.1 | 6.4 |
| Average | ... | ... | ... | ... | 3.1 | 2.9 | 2.1 | 4.0 |
| Percentage | ... | ... | ... | ... | 2.6 | 2.4 | 2.1 | 3.2 |
| Composition of | ... | ... | ... | ... | 2.61 | 3.49 | 3.43 | 3.50 |
| the Milk. | ... | ... | ... | ... | 8.71 | 9.19 | 9.13 | 9.42 |
| Solids other than Fat | ... | ... | ... | ... | 11.32 | 12.68 | 12.56 | 12.92 |
| Solids | ... | ... | ... | ... | .078 | .101 | .072 | .14 |
| Actual weight of Fat, in lbs. | ... | ... | ... | ... | .085 | .091 | .072 | .104 |
| Calculation of Points multiply by 20 | ... | ... | ... | ... | 1.56 | 2.02 | 1.44 | 2.8 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | 1.70 | 1.82 | 1.44 | 2.08 |
| Calculation of Points multiply by 4 | ... | ... | ... | ... | .27 | .267 | .192 | .378 |
| Points | ... | ... | ... | ... | .231 | .216 | .768 | .3 |
| For time since Kidding | ... | ... | ... | ... | 1.08 | 1.068 | 1.064 | 1.512 |
| For weight of Milk | ... | ... | ... | ... | 4.28 | 3.28 | 2.86 | 2.63 |
| For weight of Fat | ... | ... | ... | ... | 5.70 | 5.30 | 4.70 | 7.20 |
| For weight of Solids other than Fat | ... | ... | ... | ... | 3.26 | 3.84 | 3.18 | 4.88 |
| Total | ... | ... | ... | ... | 2.00 | 1.93 | 1.72 | 2.71 |
| Deductions | ... | ... | ... | ... | 15.24 | 14.35 | 12.46 | 17.42 |
| Points gained | ... | ... | ... | ... | 2.00 | 2.00 | 2.00 | 2.0 |
| Remarks and Awards | ... | ... | ... | ... | 13.24 | 12.35 | 10.46 | 15.42 |
| | ... | ... | ... | ... | High Commendation. | Commendation. | | 3rd Prize. |

CLASS 24.—GOATS—Continued.

| Number ... Name ... | ... | ... | ... | ... | 231 Forest Nonentity. April 10, 1912. 6 May 28. 145 | 243 Brookbourne Fairy Queen. Feb. 24, 1910. Mar. 16, 1915. 221 | 246 Lenzes Lisimore. Feb. 21, 1913. July 27. 85 | 248 Corthorne Jezebel. April 16, 1913. June 26. 116 |
|---|-----|-----|-----|-----|--|--|---|---|
| | | | | | | | | |
| Born ... | ... | ... | ... | ... | Morn | Morn | Morn | Morn |
| Number of Kids ... | ... | ... | ... | ... | Even | Even | Even | Even |
| Last Kidding ... | ... | ... | ... | ... | 2.1 1.8 | 3.3 2.5 | 3.8 3.2 | 2.0 1.9 |
| Days since Kidding ... | ... | ... | ... | ... | 2.4 2.0 | 3.2 2.3 | 4.2 3.4 | 2.9 2.3 |
| Weight of Milk, 1st day ... | ... | ... | ... | ... | 4.5 3.8 | 6.5 4.8 | 8.0 6.6 | 4.9 4.2 |
| Weight of Milk, 2nd day ... | ... | ... | ... | ... | 2.2 1.9 | 3.2 2.4 | 4.0 3.3 | 2.4 2.1 |
| Total ... | ... | ... | ... | ... | 4.52 4.52 | 3.79 3.45 | 3.29 3.20 | 3.52 3.42 |
| Average ... | ... | ... | ... | ... | 9.12 9.32 | 8.97 9.11 | 9.15 8.80 | 9.20 9.34 |
| Percentage of Fat ... | ... | ... | ... | ... | 13.64 13.84 | 12.76 12.56 | 12.44 12.00 | 12.72 12.76 |
| Composition of Solids other than Fat the Milk. | ... | ... | ... | ... | Actual weight of Fat, in lbs. ... | 12.12 12.083 | 12.44 12.00 | 12.72 12.76 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | ... | Calculation of Points multiply by 20 | 2.42 1.66 | 2.64 2.12 | 1.70 1.44 |
| Calculation of Points multiply by 20 | ... | ... | ... | ... | Actual weight of Solids other than Fat, in lbs. | 2.88 .22 | 3.66 .29 | 2.22 .196 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | Calculation of Points multiply by 4 | 1.152 .88 | 1.464 1.16 | .888 .784 |
| Calculation of Points multiply by 4 | ... | ... | ... | ... | For time since Kidding ... | 3.68 | 1.41 | 1.93 |
| Points { For weight of Milk ... | ... | ... | ... | ... | For weight of Milk ... | 5.60 | 7.30 | 4.50 |
| { For weight of Fat ... | ... | ... | ... | ... | For weight of Fat ... | 4.08 | 4.76 | 3.14 |
| { For weight of Solids other than Fat ... | ... | ... | ... | ... | For weight of Solids other than Fat ... | 2.03 | 2.62 | 1.67 |
| Total ... | ... | ... | ... | ... | Total ... | 15.39 | 16.09 | 11.24 |
| Deductions ... | ... | ... | ... | ... | Deductions ... | 2.00 | 2.00 | 2.00 |
| Points gained ... | ... | ... | ... | ... | Points gained ... | 13.39 | 14.09 | 9.24 |
| Remarks and Awards ... | ... | ... | ... | ... | Reserve. | 4th Prize. | | |

CLASS 24.—GOATS—Continued.

| | | | | | | |
|---|-----|-----|-----|-----|-----|-----------------|
| Number ... | ... | ... | ... | ... | ... | 249 |
| Name ... | ... | ... | ... | ... | ... | Withdean Molly. |
| Born ... | ... | ... | ... | ... | ... | May 15, 1913. |
| Number of Kids ... | ... | ... | ... | ... | ... | 2 |
| Last Kided ... | ... | ... | ... | ... | ... | April 28. |
| Days since Kidding ... | ... | ... | ... | ... | ... | 175 |
| Weight of Milk, 1st day | ... | ... | ... | ... | ... | Morn Even |
| Weight of Milk, 2nd day | ... | ... | ... | ... | ... | 2.8 2.3 |
| Total | ... | ... | ... | ... | ... | 3.0 2.5 |
| Average | ... | ... | ... | ... | ... | 5.8 4.8 |
| Percentage { Fat ... | ... | ... | ... | ... | ... | 2.9 2.4 |
| Composition of { Solids other than Fat | ... | ... | ... | ... | ... | 3.41 2.87 |
| the Milk. { Solids | ... | ... | ... | ... | ... | 8.87 8.73 |
| Actual weight of Fat, in lbs. ... | ... | ... | ... | ... | ... | 12.28 11.60 |
| Calculation of Points multiply by 20 | ... | ... | ... | ... | ... | .089 .089 |
| Actual weight of Solids other than Fat, in lbs. | ... | ... | ... | ... | ... | 1.98 1.38 |
| Calculation of Points multiply by 4 | ... | ... | ... | ... | ... | .258 .21 |
| Points { For time since Kidding | ... | ... | ... | ... | ... | 1.032 .84 |
| { For weight of Milk ... | ... | ... | ... | ... | ... | 2.91 |
| { For weight of Fat ... | ... | ... | ... | ... | ... | 5.30 |
| { For weight of Solids other than Fat | ... | ... | ... | ... | ... | 3.36 |
| Total | ... | ... | ... | ... | ... | 1.87 |
| Deductions | ... | ... | ... | ... | ... | 13.44 |
| Points gained | ... | ... | ... | ... | ... | 2.00 |
| Remarks and Awards ... | ... | ... | ... | ... | ... | 11.44 |

THE BUTTER TESTS, 1915.

By R. H. EVANS, B.Sc.,

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The 1915 Butter Tests were carried out on similar lines to those obtaining in 1914.

The prizes were awarded according to the following scale of points:—

One point for every ounce of butter ; one point for every completed 10 days since calving, deducting the first 40 days. Maximum allowance for period of lactation, 12 points.

Fractions of ounces of butter, and incomplete periods of less than 10 days, to be worked out in decimals, and added to the total points.

In the case of cows obtaining the same number of points, the prize to be awarded to the cow that has been the longest time in milk.

No prize to be given to animals in the Butter Tests which do not come up to the following standard :—

| Breed. | Cows under 5 years. Points. | Cows 5 years and over. Points. |
|--------------------------------|-----------------------------------|--------------------------------------|
| Pedigree Shorthorns | 30 | 34 |
| Non-Pedigree Shorthorns | 30 | 34 |
| British Holsteins | 30 | 34 |
| Lincoln Red Shorthorns | 30 | 34 |
| Jerseys | 30 | 35 |
| Guernseys | 27 | 30 |
| Ayrshires | 27 | 30 |
| Red Polls | 27 | 30 |
| South Devons | 30 | 34 |
| Kerries | 26 | 29 |
| Dexter | 26 | 29 |

Certificates of Merit and Highly commended cards will be given to animals other than prize winners that reach the above standard.

The total number of entries in 1915 were as follows:—

| | |
|--------------------------------|----|
| Pedigree Shorthorns | 17 |
| Non-Pedigree Shorthorns | 19 |
| Lincoln Red Shorthorns | 3 |
| Jerseys | 12 |
| Guernseys | 7 |
| Red Poll | 2 |
| South Devons | 3 |
| Holsteins | 2 |

Of the above total of 65—which is 7 more than in 1914—only 45 competed, exactly the same number as in 1914. Some heavy milkers

were found among the cattle competing, and in this respect, Mr. W. R. Wallace's "Toddington Princess" with 71 lbs. 11 ozs., Mr. Sam Raingill's "Liberty" with 69 lbs. 11 ozs., and Mr. James Sheppy's "Model Lily 2nd" with 69 lbs. 3 ozs. are worthy of notice.

The yield of butter from these heavy milkers was, however, in some cases disappointing.

The largest amount of butter from 24 hours' milk was yielded by Mr. Sam Raingill's "Lizzie." This cow gave 2 lbs. 15½ ozs., on 48 lbs. 5 ozs. of milk, showing a butter ratio of 1 in 16·27—a wonderful performance for a Shorthorn. The second prize in the Shorthorn class was awarded to Mr. Raingill's "Liberty," a cow which yielded 2 lbs. 11½ ozs. of butter in 24 hours, with a butter ratio of 1 in 25·78. Mr. J. Moffat's "Fill-pail," with 2 lbs. 10¾ ozs. of butter, and a butter ratio of 1 in 19·44; and Mr. J. L. Shirley's "Silverton Verona," yielding 2 lbs. 10 ozs., with a butter ratio of 1 in 22·24, deserve special mention.

In the Jersey class, Mr. Smith-Barry's "Marionette," which yielded 2 lbs. 5 ozs. of butter on 40 lbs. 2 ozs. of milk, carried the first prize.

There was no outstanding yield in the case of the other breeds.

The following table gives the average results of the test for all breeds.

| Year. | | | Total No. of Cows. | Average weight of 24 hours' Milk. | Average Yield of Butter. | Average Butter Ratio. | Average No. of Points. |
|-------|----|----|--------------------------|--|--------------------------------|-----------------------------|------------------------------|
| | | | | lbs. | lbs. ozs. | | |
| 1909 | .. | .. | 61 | 42 | 1 12¾ | 23·51 | 33·30 |
| 1910 | .. | .. | 62 | 44 | 1 12½ | 25·03 | 32·50 |
| 1911 | .. | .. | 55 | 43½ | 1 11 | 25·87 | 30·90 |
| 1912 | .. | .. | 54 | 49½ | 1 14¾ | 25·82 | 33·08 |
| 1913 | .. | .. | 62 | 42 | 1 9½ | 26·05 | 29·26 |
| 1914 | .. | .. | 45 | 45½ | 1 12¾ | 25·67 | 31·69 |
| 1915 | .. | .. | 45 | 46½ | 1 9 | 29·83 | 28·49 |

My colleagues, Mr. T. W. Hammond and Mr. L. J. Craufurd, representing the Jersey Cattle Society, rendered me very valuable assistance, in the carrying out of the tests, to whom my best thanks are due.

TABLE I.—NUMBER OF CATTLE TESTED SINCE 1897.

| Breed | 1897 | 1898 | 1899 | 1900 | 1901 | 1902 | 1903 | 1904 | 1905 | 1906 | 1907 | 1908 | 1909 | 1910 | 1911 | 1912 | 1913 | 1914 | 1915 |
|------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Shorthorns | 9 | 23 | 21 | 22 | 15 | 31 | 18 | 14 | 17 | 22 | 26 | 26 | 19 | 22 | 26 | 30 | 26 | 20 | 20 |
| Lincoln Reds | — | — | — | — | — | — | — | — | — | — | 7 | 9 | 8 | 8 | 6 | 6 | 5 | 4 | 2 |
| Jerseys | 14 | 17 | 15 | 29 | 25 | 30 | 20 | 12 | 18 | 13 | 13 | 16 | 22 | 18 | 18 | 7 | 18 | 9 | 10 |
| Guernseys | 3 | 5 | 4 | 7 | 8 | 1 | 5 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 6 | 5 | 7 |
| Red Polls ... | 7 | 4 | 9 | 7 | 2 | 6 | 5 | 4 | 11 | 12 | 11 | 3 | 4 | 4 | 1 | 1 | — | — | 1 |
| Ayrshires ... | 3 | 1 | 2 | — | 1 | 1 | — | 1 | 3 | 2 | — | 4 | — | 1 | — | 4 | — | — | — |
| Sth. Devons | — | — | — | — | — | — | 2 | 2 | 3 | 5 | — | — | 4 | 7 | 2 | 4 | 2 | 6 | 3 |
| Dutch | 1 | — | — | — | — | — | 1 | — | — | — | — | — | — | — | — | — | — | — | — |
| Kerries and Dexters | — | 1 | 2 | — | 1 | 2 | — | 2 | 1 | 2 | 2 | 5 | 2 | — | 1 | — | 5 | — | — |
| Welsh | — | 1 | 1 | 1 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Cross-breds | 4 | 1 | 6 | 2 | 2 | 11 | 8 | 6 | 8 | 10 | — | — | — | — | — | — | — | — | — |
| Holsteins ... | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 1 | 2 |
| | 41 | 53 | 60 | 68 | 54 | 82 | 59 | 44 | 64 | 68 | 61 | 65 | 61 | 62 | 55 | 54 | 62 | 45 | 45 |

TABLE II.—NUMBER OF CATTLE OF THE VARIOUS BREEDS TESTED SINCE 1895, WITH THEIR AVERAGE PERIOD OF LACTATION, WEIGHT OF BUTTER, BUTTER RATIOS, AND POINTS.

| Year | No. | Breed | Average No. of Days in Milk | Average Weight of Butter | Average Butter Ratio | Average No. of Points |
|-------------------|-----|----------------|-----------------------------|--------------------------|----------------------|-----------------------|
| From 1895 to 1900 | 106 | Shorthorns ... | 50½ | lbs. ozs. 1 11 | lbs. 28.81 | — |
| 1901 | 15 | " ... | 44 | 2 0½ | 26.69 | 33.69 |
| 1902 | 31 | " ... | 50 | 1 11½ | 27.38 | 23.89 |
| 1903 | 18 | " ... | 41 | 1 11 | 38.59 | 28.44 |
| 1904 | 14 | " ... | 41½ | 1 10 | 29.31 | 27.47 |
| 1905 | 17 | " ... | 53 | 1 13½ | 27.65 | 31.25 |
| 1906 | 22 | " ... | 58 | 1 6½ | 32.87 | 25.08 |
| 1907 | 26 | " ... | 62 | 1 11¾ | 29.23 | 30.24 |
| 1908 | *35 | " ... | 49 | 1 11 | 29.39 | 28.05 |
| 1909 | 19 | " ... | 54 | 1 14 | 27.25 | 32.31 |
| 1910 | 22 | " ... | 43 | 1 13½ | 27.53 | 31.39 |
| 1911 | 26 | " ... | 39 | 1 12½ | 28.42 | 29.28 |
| 1912 | 30 | " ... | 44 | 2 0½ | 26.58 | 33.75 |
| 1913 | 26 | " ... | 38 | 1 10½ | 31.45 | 27.54 |
| 1914 | 20 | " ... | 40 | 1 13½ | 27.61 | 29.50 |
| 1915 | 20 | " ... | 44 | 1 10½ | 33.63 | 26.99 |
| 1907 | 7 | Lincoln Reds | 57 | 1 13½ | 28.31 | 31.91 |
| 1908 | 9 | " ... | 61 | 1 12 | 28.00 | 30.60 |
| 1909 | 8 | " ... | 44 | 1 14½ | 24.81 | 32.09 |
| 1910 | 8 | " ... | 79 | 1 10½ | 27.15 | 31.39 |
| 1911 | 6 | " ... | 78 | 1 11 | 27.03 | 30.97 |
| 1912 | 6 | " ... | 36 | 1 14½ | 26.72 | 30.92 |
| 1913 | 5 | " ... | 44 | 1 13½ | 27.78 | 29.72 |
| 1914 | 4 | " ... | 49 | 1 9½ | 30.21 | 27.37 |
| 1915 | 2 | " ... | 106 | 1 10½ | 52.81 | 32.11 |
| „ 1895 to 1900 | 126 | Jerseys ... | 99 | 1 10½ | 19.15 | — |
| 1901 | 25 | " ... | 141 | 1 9½ | 17.80 | 34.44 |
| 1902 | 30 | " ... | 124 | 1 10 | 18.46 | 33.19 |
| 1903 | 20 | " ... | 141 | 1 11 | 18.12 | 36.13 |
| 1904 | 12 | " ... | 117 | 1 13½ | 19.62 | 36.79 |
| 1905 | 18 | " ... | 134 | 1 10½ | 19.48 | 35.51 |
| 1906 | 13 | " ... | 119 | 1 10½ | 20.89 | 33.49 |
| 1907 | 13 | " ... | 111 | 1 11 | 19.71 | 34.49 |
| 1908 | 16 | " ... | 115 | 1 7½ | 22.35 | 30.00 |
| 1909 | 22 | " ... | 116 | 1 13½ | 18.36 | 37.12 |
| 1910 | 18 | " ... | 123 | 1 13½ | 18.43 | 37.05 |
| 1911 | 18 | " ... | 116 | 1 11½ | 19.98 | 34.11 |
| 1912 | 7 | " ... | 143 | 2 1 | 18.26 | 40.77 |
| 1913 | 18 | " ... | 136 | 1 10½ | 19.24 | 35.85 |
| 1914 | 9 | " ... | 142 | 1 15 | 18.77 | 40.12 |
| 1915 | 10 | " ... | 123 | 1 11½ | 19.00 | 35.56 |
| „ 1895 to 1900 | 23 | Guernseys ... | 71½ | 1 9½ | 21.86 | — |
| 1901 | 8 | " ... | 81 | 1 8½ | 21.43 | 29.51 |
| 1902 | 1 | " ... | 17 | 1 3½ | 21.46 | 19.75 |
| 1903 | 5 | " ... | 52 | 1 1 | 27.77 | 18.93 |
| 1904 | 3 | " ... | 98½ | 1 10 | 20.65 | 31.91 |
| 1905 | 3 | " ... | 165½ | 1 6½ | 19.66 | 31.78 |
| 1906 | 2 | " ... | 138 | 1 3½ | 27.00 | 28.45 |

TABLE II.—NUMBER OF CATTLE OF THE VARIOUS BREEDS TESTED SINCE 1895, WITH THEIR AVERAGE PERIOD OF LACTATION, WEIGHT OF BUTTER, BUTTER RATIOS, AND POINTS—*Continued.*

| Year | No. | Breed | Average No. of Days in Milk | Average Weight of Butter | Average Butter Ratio | Average No. of Points |
|-------------------|-----|---------------|--------------------------------------|--------------------------------|----------------------------|-----------------------------|
| | | | | lbs. ozs. | lbs. | |
| 1907 | 2 | Guernseys ... | 82 | 1 12 $\frac{1}{2}$ | 18.90 | 33.48 |
| 1908 | 2 | " ... | 142 | 1 13 $\frac{1}{2}$ | 19.47 | 37.90 |
| 1909 | 2 | " ... | 66 | 1 9 $\frac{1}{2}$ | 21.13 | 28.27 |
| 1910 | 2 | " ... | 57 | 1 3 $\frac{3}{4}$ | 26.80 | 21.93 |
| 1911 | 1 | " ... | 181 | 0 14 | 39.28 | 26.00 |
| 1912 | 2 | " ... | 53 | 1 2 $\frac{1}{2}$ | 24.32 | 20.55 |
| 1913 | 6 | " ... | 139 | 1 6 $\frac{1}{2}$ | 21.94 | 30.66 |
| 1914 | 5 | " ... | 110 | 1 6 $\frac{1}{4}$ | 21.88 | 29.53 |
| 1915 | 7 | " ... | 107 | 1 6 $\frac{1}{4}$ | 22.30 | 30.09 |
| From 1895 to 1900 | 30 | Red Polls ... | 60 $\frac{1}{2}$ | 1 4 $\frac{3}{4}$ | 30.29 | — |
| 1901 | 2 | " ... | 80 | 1 8 $\frac{5}{8}$ | 25.50 | 28.77 |
| 1902 | 6 | " ... | 83 | 1 6 $\frac{3}{8}$ | 26.84 | 26.92 |
| 1903 | 5 | " ... | 124 | 1 0 | 39.60 | 21.39 |
| 1904 | 4 | " ... | 115 $\frac{1}{2}$ | 1 5 $\frac{1}{2}$ | 30.34 | 29.06 |
| 1905 | 11 | " ... | 74 $\frac{1}{2}$ | 1 3 $\frac{1}{2}$ | 28.78 | 22.76 |
| 1906 | 12 | " ... | 76 | 0 15 | 39.15 | 18.81 |
| 1907 | 11 | " ... | 99 | 1 2 $\frac{1}{4}$ | 33.21 | 23.96 |
| 1908 | 3 | " ... | 92 | 1 1 | 35.00 | 22.16 |
| 1909 | 4 | " ... | 86 | 1 4 $\frac{1}{2}$ | 32.73 | 25.37 |
| 1910 | 4 | " ... | 78 | 1 4 $\frac{1}{2}$ | 30.81 | 24.35 |
| 1911 | 1 | " ... | 76 | 0 15 | 36.60 | 18.60 |
| 1912 | 1 | " ... | 26 | 1 0 | 43.80 | 16.00 |
| 1913 | — | " ... | — | — | — | — |
| 1914 | — | " ... | — | — | — | — |
| 1915 | 1 | " ... | 31 | — | — | — |
| „ 1895 to 1900 | 8 | Ayrshires ... | 52 | 1 13 $\frac{1}{4}$ | 26.35 | — |
| 1901 | 1 | " ... | 125 | 1 7 $\frac{1}{2}$ | 27.65 | 32.10 |
| 1902 | 1 | " ... | 33 | 1 3 $\frac{1}{2}$ | 18.00 | 19.50 |
| 1903 | — | " ... | — | — | — | — |
| 1904 | 1 | " ... | 116 | 0 12 $\frac{1}{2}$ | 35.20 | 20.10 |
| 1905 | 3 | " ... | 77 | 1 2 $\frac{1}{2}$ | 28.07 | 22.88 |
| 1906 | 2 | " ... | 23 | 1 11 $\frac{1}{4}$ | 25.51 | 27.70 |
| 1907 | — | " ... | — | — | — | — |
| 1908 | 4 | " ... | 75 | 1 2 | 35.19 | 21.00 |
| 1909 | — | " ... | — | — | — | — |
| 1910 | 1 | " ... | 88 | 1 15 | 25.93 | 35.80 |
| 1911 | — | " ... | — | — | — | — |
| 1912 | 4 | " ... | 71 | 1 5 $\frac{1}{2}$ | 32.52 | 24.65 |
| 1913 | — | " ... | — | — | — | — |
| 1914 | — | " ... | — | — | — | — |
| 1915 | — | " ... | — | — | — | — |
| 1909 | 4 | South Devons | 105 | 1 13 $\frac{3}{4}$ | 24.77 | 33.66 |
| 1910 | 7 | " ... | 91 | 1 11 $\frac{1}{4}$ | 29.33 | 32.87 |
| 1911 | 2 | " ... | 144 | 1 5 | 38.98 | 31.52 |
| 1912 | 4 | " ... | 90 | 1 15 $\frac{1}{2}$ | 26.51 | 36.74 |
| 1913 | 2 | " ... | 62 | 1 8 $\frac{1}{4}$ | 30.96 | 26.50 |
| 1914 | 6 | " ... | 78 | 1 12 | 28.85 | 32.11 |
| 1915 | 3 | " ... | 42 | 1 1 $\frac{1}{4}$ | 40.50 | 17.88 |

TABLE II.—NUMBER OF CATTLE OF THE VARIOUS BREEDS TESTED SINCE 1895, WITH THEIR AVERAGE PERIOD OF LACTATION, WEIGHT OF BUTTER, BUTTER RATIOS, AND POINTS—*Continued.*

| Year | No. | Breed | Average No. of Days in Milk | Average Weight of Butter | Average Butter Ratio | Average No. of Points |
|-------------------|-----|---------------------|-----------------------------|---------------------------------|----------------------|-----------------------|
| From 1895 to 1900 | 3 | Dexters and Kerries | 117 | lbs. ozs. 0 14 $\frac{3}{4}$ | 40.80 | — |
| 1901 | 1 | " ... | 83 | 1 6 $\frac{1}{4}$ | 21.17 | 26.55 |
| 1902 | 2 | " ... | 46 | 1 7 $\frac{3}{8}$ | 21.28 | 23.49 |
| 1903 | — | " ... | — | — | — | — |
| 1904 | 2 | " ... | 72 | 0 14 $\frac{3}{4}$ | 21.31 | 18.45 |
| 1905 | 1 | " ... | 149 | 1 1 $\frac{1}{4}$ | 23.47 | 28.15 |
| 1906 | 2 | " ... | 33 | 1 13 | 22.40 | 29.10 |
| 1907 | 2 | " ... | 65 | 1 11 $\frac{1}{4}$ | 21.06 | 29.70 |
| 1908 | 5 | " ... | 124 | 1 6 | 24.47 | 29.13 |
| 1909 | 2 | Kerries ... | 75 | 1 6 | 20.86 | 25.65 |
| 1910 | — | " ... | — | — | — | — |
| 1911 | 1 | " ... | 162 | 1 3 $\frac{1}{2}$ | 28.51 | 31.50 |
| 1912 | — | " ... | — | — | — | — |
| 1913 | 5 | " ... | 43 | 1 3 | 25.98 | 19.70 |
| 1914 | — | " ... | — | — | — | — |
| 1915 | — | " ... | — | — | — | — |
| 1914 | 1 | Holsteins ... | 102 | 1 3 $\frac{1}{2}$ | 44.87 | 25.70 |
| 1915 | 2 | " ... | 40 | 1 12 | 38.51 | 29.20 |

TABLE III.—AVERAGE YIELD OF BUTTER OF THE DIFFERENT BREEDS AT DIFFERENT PERIODS.

| Year | Breed | No. of Cows | Days in Milk, 50 | No. of Cows | Days in Milk, 100 | No. of Cows | Days in Milk, 135 | No. of Cows | Days in Milk, 190 |
|---------|--------------|-------------|--------------------|-------------|--------------------|-------------|--------------------|-------------|--------------------|
| 1895 to | | | lbs. ozs. | | lbs. ozs. | | lbs. ozs. | | lbs. ozs. |
| 1900 | Shorthorns | 19 | 1 12 $\frac{1}{2}$ | 6 | 1 7 $\frac{1}{2}$ | 2 | 1 4 $\frac{3}{8}$ | 8 | 1 1 $\frac{1}{2}$ |
| 1901 | " | 2 | 1 8 | — | — | 1 | 2 6 | — | — |
| 1902 | " | 6 | 1 10 $\frac{1}{2}$ | — | — | 1 | 1 11 | — | — |
| 1903 | " | 3 | 1 7 | — | — | 1 | 1 6 $\frac{1}{4}$ | — | — |
| 1904 | " | 3 | 1 10 $\frac{1}{3}$ | 1 | 1 14 $\frac{1}{2}$ | — | — | — | — |
| 1905 | " | 2 | 1 1 | 1 | 2 0 $\frac{1}{2}$ | 2 | 1 7 $\frac{3}{4}$ | — | — |
| 1906 | " | 11 | 1 8 $\frac{1}{2}$ | 3 | 1 3 $\frac{3}{4}$ | — | — | — | — |
| 1907 | " | 11 | 1 9 $\frac{1}{4}$ | 2 | 1 9 $\frac{3}{4}$ | 1 | 0 15 $\frac{3}{4}$ | — | — |
| 1908 | " | 11 | 1 11 $\frac{3}{4}$ | — | — | 2 | 1 12 | — | — |
| 1909 | " | 11 | 2 0 $\frac{3}{4}$ | 5 | 1 11 $\frac{1}{2}$ | 3 | 1 8 $\frac{1}{2}$ | — | — |
| 1910 | " | 16 | 1 14 $\frac{1}{2}$ | 5 | 2 1 | 1 | 1 3 $\frac{1}{2}$ | — | — |
| 1911 | " | 20 | 1 13 | 6 | 1 9 $\frac{1}{2}$ | — | — | — | — |
| 1912 | " | 23 | 2 2 $\frac{3}{4}$ | 6 | 1 8 $\frac{3}{4}$ | 1 | 1 14 | — | — |
| 1913 | " | 20 | 1 11 | 5 | 1 8 $\frac{1}{4}$ | 1 | 1 5 | — | — |
| 1914 | " | 17 | 1 15 | 1 | 0 12 | 2 | 1 7 $\frac{1}{2}$ | — | — |
| 1915 | " | 17 | 1 11 $\frac{1}{4}$ | 2 | 1 5 | — | — | — | — |
| 1907 | Lincoln Reds | 3 | 1 12 | 1 | 1 11 | — | — | — | — |
| 1909 | " | 6 | 2 1 | 1 | 1 9 $\frac{3}{4}$ | 1 | 1 7 | — | — |
| 1910 | " | 4 | 1 10 $\frac{1}{2}$ | — | — | 3 | 1 10 $\frac{1}{2}$ | 1 | 1 13 $\frac{1}{2}$ |
| 1911 | " | 4 | 1 10 $\frac{1}{2}$ | — | — | — | — | 2 | 1 12 |
| 1912 | " | 5 | 1 15 $\frac{1}{2}$ | 1 | 1 8 $\frac{1}{2}$ | — | — | — | — |
| 1913 | " | 5 | 1 13 $\frac{1}{2}$ | — | — | — | — | — | — |
| 1914 | " | 3 | 1 9 | 1 | 1 12 | — | — | — | — |
| 1915 | " | — | — | 1 | 1 13 $\frac{1}{2}$ | — | — | 1 | 1 7 |
| 1895 to | | | | | | | | | |
| 1900 | Jerseys | 23 | 1 10 $\frac{1}{4}$ | 15 | 1 8 $\frac{1}{2}$ | 11 | 1 8 $\frac{1}{2}$ | 31 | 1 10 $\frac{1}{2}$ |
| 1901 | " | 1 | 1 12 | 8 | 1 7 $\frac{3}{4}$ | 6 | 1 9 | 12 | 1 10 $\frac{1}{2}$ |
| 1902 | " | 4 | 1 9 $\frac{3}{16}$ | 3 | 1 8 $\frac{3}{8}$ | 2 | 1 14 | 9 | 1 11 |
| 1903 | " | 4 | 1 9 $\frac{1}{8}$ | 5 | 1 15 | 9 | 1 9 $\frac{3}{8}$ | 2 | 1 9 $\frac{3}{8}$ |
| 1904 | " | 2 | 1 10 $\frac{1}{8}$ | 3 | 2 2 $\frac{1}{2}$ | 4 | 2 0 $\frac{1}{16}$ | 1 | 1 13 $\frac{1}{2}$ |
| 1905 | " | 3 | 1 8 $\frac{1}{4}$ | 4 | 1 15 $\frac{1}{4}$ | 8 | 1 9 $\frac{1}{4}$ | 2 | 1 8 $\frac{1}{4}$ |
| 1906 | " | 5 | 1 10 $\frac{1}{4}$ | 3 | 1 3 $\frac{3}{4}$ | 4 | 1 15 $\frac{1}{4}$ | 1 | 1 5 $\frac{1}{4}$ |
| 1907 | " | 6 | 1 13 $\frac{1}{2}$ | 2 | 1 7 $\frac{3}{8}$ | 3 | 1 13 | 1 | 1 4 |
| 1908 | " | 4 | 1 14 $\frac{1}{2}$ | 3 | 1 10 | 4 | 1 1 | 2 | 1 2 |
| 1909 | " | 3 | 1 3 | 4 | 2 2 $\frac{1}{2}$ | 6 | 1 14 $\frac{3}{4}$ | 9 | 1 12 |
| 1910 | " | 2 | 1 10 $\frac{1}{2}$ | 5 | 1 13 $\frac{1}{2}$ | 2 | 1 15 $\frac{1}{2}$ | 7 | 1 13 $\frac{1}{2}$ |
| 1911 | " | 3 | 1 0 $\frac{3}{4}$ | 6 | 1 11 | 1 | 2 5 $\frac{1}{2}$ | 4 | 1 12 $\frac{1}{2}$ |
| 1912 | " | — | — | 2 | 1 8 $\frac{3}{4}$ | 2 | 2 1 | — | — |
| 1913 | " | 1 | 1 5 $\frac{1}{4}$ | 5 | 1 11 | 1 | 1 12 | 8 | 1 7 |
| 1914 | " | 1 | 1 8 | 1 | 2 1 $\frac{1}{2}$ | 1 | 1 10 | 4 | 2 1 |
| 1915 | " | 2 | 1 9 $\frac{1}{2}$ | 1 | 1 8 | 1 | 2 0 $\frac{1}{4}$ | 5 | 1 13 $\frac{1}{4}$ |
| 1895 to | | | | | | | | | |
| 1900 | Guernseys | 3 | 1 7 $\frac{1}{2}$ | 4 | 1 7 $\frac{1}{2}$ | 3 | 1 4 $\frac{5}{8}$ | 1 | 1 8 |
| 1901 | " | 1 | 1 15 $\frac{1}{4}$ | 2 | 1 5 $\frac{1}{2}$ | — | — | 2 | 1 8 $\frac{3}{8}$ |
| 1902 | " | — | — | — | — | — | — | — | — |
| 1903 | " | 2 | 0 15 $\frac{1}{4}$ | — | — | — | — | — | — |
| 1904 | " | 2 | 1 6 $\frac{3}{4}$ | — | — | 1 | 2 0 $\frac{1}{2}$ | — | — |
| 1905 | " | 1 | 1 10 $\frac{1}{2}$ | — | — | 1 | 1 12 $\frac{1}{2}$ | 1 | 0 13 $\frac{1}{2}$ |
| 1906 | " | — | — | 1 | 1 1 | 1 | 1 5 $\frac{1}{2}$ | — | — |
| 1907 | " | — | — | — | — | — | — | 1 | 1 14 |
| 1908 | " | 1 | 1 13 | — | — | — | — | 1 | 1 14 |
| 1909 | " | 1 | 1 11 | 1 | 1 8 $\frac{1}{4}$ | — | — | — | — |
| 1910 | " | 1 | 1 2 $\frac{1}{2}$ | 1 | 1 3 $\frac{3}{4}$ | — | — | — | — |
| 1911 | " | — | — | — | — | — | — | 1 | 0 14 |
| 1912 | " | 1 | 1 3 | 1 | 1 2 | — | — | — | — |
| 1913 | " | 1 | 1 8 | 1 | 1 6 $\frac{3}{4}$ | 1 | 1 12 | — | — |
| 1914 | " | 2 | 1 11 | — | — | — | — | 3 | 1 3 $\frac{1}{2}$ |
| 1915 | " | 1 | 0 14 $\frac{1}{4}$ | 2 | 1 14 | 2 | 1 7 $\frac{3}{4}$ | 2 | 1 5 $\frac{1}{2}$ |

TABLE III.—AVERAGE YIELD OF BUTTER OF THE DIFFERENT
BREEDS AT DIFFERENT PERIODS—*Continued.*

| Year | Breed | No. of Cows | Days in Milk, 50 | No. of Cows | Days in Milk, 100 | No. of Cows | Days in Milk, 135 | No. of Cows | Days in Milk, 190 |
|---------|----------------------|----------------|---------------------|----------------|----------------------|----------------|----------------------|----------------|----------------------|
| 1895 to | | | lbs. ozs. | | lbs. ozs. | | lbs. ozs. | | lbs. ozs. |
| 1900 | Red Polls | 10 | 1 4½ | 2 | 1 8 | 2 | 0 12¾ | 1 | 0 11 |
| 1901 | " | — | — | 2 | 1 8½ | — | — | 1 | — |
| 1902 | " | — | — | 3 | 1 8 | — | — | — | 1 2½ |
| 1903 | " | 1 | 0 13¾ | 1 | 1 1¼ | — | — | 1 | 0 13 |
| 1904 | " | 1 | 1 13 | 2 | 1 1 | 1 | 1 7½ | — | — |
| 1905 | " | 3 | 1 1 | 2 | 1 5 | — | — | 1 | 0 12 |
| 1906 | " | 7 | 1 0 | — | — | 2 | 0 14½ | — | — |
| 1907 | " | 5 | 1 4 | — | — | 4 | 1 1½ | — | — |
| 1908 | " | 1 | 1 2¾ | — | — | — | — | 1 | 1 1 |
| 1909 | " | 1 | 1 12 | 1 | 1 2¾ | 1 | 1 6½ | 1 | 0 12½ |
| 1910 | " | 2 | 1 3½ | 1 | 1 9¼ | — | — | 1 | 1 2½ |
| 1911 | " | — | — | 1 | 0 15 | — | — | — | — |
| 1912 | " | 1 | 1 0 | — | — | — | — | — | — |
| 1913 | " | — | — | — | — | — | — | — | — |
| 1914 | " | — | — | — | — | — | — | — | — |
| 1915 | " | 1 | — | — | — | — | — | — | — |
| 1908 | Ayrshires | — | — | — | — | — | — | 1 | 0 12 |
| 1909 | " | — | — | — | — | — | — | — | — |
| 1910 | " | — | — | 1 | 1 15 | — | — | — | — |
| 1911 | " | — | — | — | — | — | — | — | — |
| 1912 | " | 2 | 1 4½ | 2 | 1 6½ | — | — | — | — |
| 1913 | " | — | — | — | — | — | — | — | — |
| 1909 | South Devons | 1 | 2 5¾ | 1 | 1 1¾ | — | — | 2 | 1 11½ |
| 1910 | " | 1 | 2 5¼ | 4 | 1 11½ | 1 | 2 0 | 1 | 0 12¾ |
| 1911 | " | — | — | — | — | — | — | 2 | 1 5 |
| 1912 | " | 2 | 2 0½ | — | — | 1 | 2 3½ | 1 | 1 10½ |
| 1913 | " | 1 | 2 3½ | 1 | 0 13 | — | — | — | — |
| 1914 | " | 3 | 2 1 | 1 | 1 15 | 1 | 1 4½ | 1 | 1 2½ |
| 1915 | " | 2 | 1 5½ | 1 | 0 9 | — | — | — | — |
| 1908 | Kerries & Dexters | — | — | — | — | 1 | 0 14 | 2 | 1 2 |
| 1909 | " | 1 | 1 5 | — | — | 1 | 1 7 | — | — |
| 1910 | " | — | — | — | — | — | — | — | — |
| 1911 | " | — | — | — | — | — | — | 1 | 1 3½ |
| 1912 | " | — | — | — | — | — | — | — | — |
| 1913 | " | 4 | 1 4½ | 1 | 0 13½ | — | — | — | — |
| 1914 | Holsteins | — | — | — | — | 1 | 1 3½ | — | — |
| 1915 | " | 1 | 1 14 | 1 | 1 10 | — | — | — | — |

TABLE IV.—COMPARISONS OF CHURNINGS WITH ANALYSES.
SHORTHORNS.

| No. in Catalogue | Weight of Butter Churned | | Total Fat by Analyses | | No. in Catalogue | Weight of Butter Churned | | Total Fat by Analyses | |
|------------------|--------------------------|------------------|-----------------------|-----------------|------------------|--------------------------|------------------|-----------------------|------------------|
| | lbs. | ozs. | lbs. | ozs. | | lbs. | ozs. | lbs. | ozs. |
| 1 | 1 | 3 $\frac{3}{4}$ | 1 | 10 | 32 | 2 | 11 $\frac{1}{4}$ | 2 | 13 $\frac{1}{2}$ |
| 4 | 1 | 3 $\frac{1}{4}$ | 2 | 2 | 34 | 2 | 15 $\frac{1}{2}$ | 3 | 1 |
| 5 | 1 | 7 $\frac{3}{4}$ | 2 | 2 | 36 | 2 | 9 $\frac{1}{4}$ | 2 | 9 |
| 6 | 0 | 8 | 1 | 12 | 40 | 1 | 10 $\frac{3}{4}$ | 2 | 0 $\frac{1}{2}$ |
| 10 | 1 | 4 $\frac{3}{4}$ | 1 | 12 | 41 | 2 | 10 $\frac{3}{4}$ | 2 | 7 |
| 11 | 1 | 7 $\frac{3}{4}$ | 1 | 8 $\frac{1}{2}$ | 42 | 2 | 1 | 2 | 0 $\frac{1}{2}$ |
| 13 | 1 | 0 | 2 | 1 | 44 | 1 | 13 $\frac{1}{2}$ | 1 | 10 |
| 17 | 0 | 15 $\frac{1}{4}$ | 1 | 14 | 47 | 1 | 3 $\frac{1}{4}$ | 1 | 15 |
| 18 | 1 | 5 | 1 | 7 | 49 | 0 | 15 $\frac{1}{2}$ | 1 | 4 $\frac{1}{2}$ |
| 20 | 0 | 12 $\frac{1}{4}$ | 1 | 8 | 51 | 2 | 10 | 2 | 9 |
| | | | | | 32 | | 8 $\frac{1}{4}$ | 40 | 2 $\frac{1}{2}$ |

LINCOLN REDS.

| | | | | | | | |
|----|---|------------------|-----------------|-----------------|-----------------|---|---|
| 66 | 1 | 13 $\frac{3}{4}$ | 1 | 13 | — | — | — |
| 67 | 1 | 7 | 1 | 5 $\frac{3}{4}$ | — | — | — |
| | | 3 | 4 $\frac{3}{4}$ | 3 | 2 $\frac{3}{4}$ | | |

JERSEYS.

| | | | | | | | | | |
|----|---|------------------|---|-----------------|----|---|------------------|----|------------------|
| 74 | 2 | 0 $\frac{3}{4}$ | 1 | 13 | 84 | 1 | 14 $\frac{1}{2}$ | 1 | 10 $\frac{1}{2}$ |
| 75 | 1 | 11 $\frac{1}{2}$ | 1 | 11 | 85 | 2 | 1 $\frac{1}{4}$ | 1 | 15 $\frac{1}{4}$ |
| 80 | 1 | 7 $\frac{3}{4}$ | 1 | 5 $\frac{3}{4}$ | 87 | 2 | 5 | 1 | 15 $\frac{1}{4}$ |
| 81 | 1 | 8 | 1 | 4 $\frac{1}{2}$ | 88 | 1 | 7 $\frac{3}{4}$ | 1 | 8 $\frac{1}{4}$ |
| 83 | 1 | 10 $\frac{1}{4}$ | 1 | 7 | 16 | | 2 $\frac{3}{4}$ | 14 | 10 $\frac{1}{2}$ |

GUERNSEYS.

| | | | | | | | | | |
|-----|---|------------------|---|------------------|-----|---|------------------|----|-----------------|
| 100 | 1 | 6 $\frac{1}{2}$ | 1 | 12 $\frac{1}{2}$ | 107 | 0 | 14 $\frac{1}{4}$ | 1 | 7 |
| 101 | 1 | 4 $\frac{3}{4}$ | 1 | 7 | 108 | 1 | 4 $\frac{1}{2}$ | 1 | 7 |
| 104 | 1 | 13 $\frac{1}{4}$ | 1 | 8 | 109 | 1 | 14 $\frac{1}{4}$ | 1 | 13 |
| 105 | 1 | 11 | 1 | 11 | 10 | | 5 | 11 | 1 $\frac{1}{2}$ |

SOUTH DEVONS.

| | | | | | | | | | |
|-----|---|-----------------|---|------------------|-----|---|-----------------|---|-----------------|
| 131 | 1 | 8 $\frac{1}{2}$ | 1 | 11 | 134 | 1 | 2 $\frac{1}{2}$ | 1 | 10 |
| 132 | 0 | 9 | 0 | 13 $\frac{3}{4}$ | 3 | | 3 $\frac{3}{4}$ | 4 | 2 $\frac{3}{4}$ |

BRITISH HOLSTEINS.

| | | | | | | | | | |
|-----|---|----|---|---|-----|---|----|---|----|
| 147 | 1 | 14 | 2 | 3 | 149 | 1 | 10 | 1 | 13 |
| | | | | | 3 | | 8 | 4 | 0 |

TABLE V.—AVERAGE DIFFERENCES BETWEEN CHURNINGS AND
CHEMICAL ANALYSES FROM 1898 TO 1915 INCLUSIVE.

| Year | Breed | | | | Churn | Analyses |
|------|-----------------------------|--|--|--|-------------|----------|
| | | | | | Lbs. Butter | Lbs. Fat |
| 1898 | Shorthorns | | | | 38.92 | 36.82 |
| 1899 | " | | | | 34.34 | 32.46 |
| 1900 | " | | | | 35.55 | 37.87 |
| 1901 | " | | | | 29.05 | 27.80 |
| 1902 | " | | | | 53.48 | 55.91 |
| 1903 | " | | | | 30.72 | 35.92 |
| 1904 | " | | | | 22.98 | 26.59 |
| 1905 | " | | | | 30.89 | 30.58 |
| 1906 | " | | | | 31.38 | 33.59 |
| 1907 | " | | | | 45.14 | 47.79 |
| 1908 | " | | | | 43.74 | 49.78 |
| 1909 | " | | | | 35.06 | 35.91 |
| 1910 | " | | | | 41.62 | 44.75 |
| 1911 | " | | | | 47.79 | 48.00 |
| 1912 | " | | | | 61.10 | 63.85 |
| 1913 | " | | | | 43.01 | 48.69 |
| 1914 | " | | | | 36.87 | 39.14 |
| 1915 | " | | | | 32.50 | 40.15 |
| 1907 | Lincolnshire Red Shorthorns | | | | 12.84 | 12.31 |
| 1908 | " | | | | 15.79 | 15.56 |
| 1909 | " | | | | 14.06 | 13.48 |
| 1910 | " | | | | 13.37 | 13.62 |
| 1911 | " | | | | 10.16 | 10.00 |
| 1912 | " | | | | 11.47 | 12.00 |
| 1913 | " | | | | 9.12 | 8.65 |
| 1914 | " | | | | 6.44 | 6.47 |
| 1915 | " | | | | 3.29 | 3.16 |
| 1898 | Jerseys | | | | 29.15 | 27.26 |
| 1899 | " | | | | 23.61 | 22.54 |
| 1900 | " | | | | 39.75 | 39.32 |
| 1901 | " | | | | 33.19 | 31.82 |
| 1902 | " | | | | 43.61 | 41.03 |
| 1903 | " | | | | 27.04 | 26.41 |
| 1904 | " | | | | 22.22 | 22.06 |
| 1905 | " | | | | 24.53 | 22.44 |
| 1906 | " | | | | 19.56 | 18.71 |
| 1907 | " | | | | 22.64 | — |
| 1908 | " | | | | 22.25 | — |
| 1909 | " | | | | 37.65 | 35.89 |
| 1910 | " | | | | *30.37 | 30.18 |
| 1911 | " | | | | 27.62 | 26.18 |
| 1912 | " | | | | 14.39 | 13.39 |
| 1913 | " | | | | 29.54 | †29.90 |
| 1914 | " | | | | 17.44 | 16.14 |
| 1915 | " | | | | 16.16 | 14.67 |
| 1898 | Guernseys | | | | 18.07 | 8.25 |
| 1899 | " | | | | 15.90 | 5.53 |
| 1900 | " | | | | 0.84 | 11.10 |
| 1901 | " | | | | 2.46 | 11.59 |
| 1902 | " | | | | 1.23 | 1.34 |
| 1903 | " | | | | 5.34 | 6.47 |
| 1904 | " | | | | 4.89 | 4.94 |
| 1905 | " | | | | 3.42 | 3.42 |

* Excluding Nos. 142 and 146.

† Does not include the fat of Jersey Heifers competing in the Tests.

TABLE V.—AVERAGE DIFFERENCES BETWEEN CHURNINGS AND
CHEMICAL ANALYSES FROM 1898 TO 1915 INCLUSIVE—*Continued.*

| Year | Breed | Churn | Analyses |
|------|----------------------------|-------------|----------|
| | | Lbs. Butter | Lbs. Fat |
| 1906 | Guernseys | 2.41 | 1.82 |
| 1907 | " | 3.54 | 3.22 |
| 1908 | " | 3.69 | 3.52 |
| 1909 | " | 3.20 | 3.52 |
| 1910 | " | 2.44 | 2.81 |
| 1911 | " | .87 | 1.50 |
| 1912 | " | 2.31 | 2.46 |
| 1913 | " | †8.48 | 7.59 |
| 1914 | " | †4.96 | 5.28 |
| 1915 | " | 10.31 | 11.08 |
| 1898 | Red Polls | 5.04 | 5.56 |
| 1899 | " | 8.48 | 8.33 |
| 1900 | " | 8.08 | 9.81 |
| 1901 | " | 3.07 | 2.88 |
| 1902 | " | 8.36 | 8.00 |
| 1903 | " | 5.01 | 6.95 |
| 1904 | " | 5.39 | 6.00 |
| 1905 | " | 13.42 | 14.53 |
| 1906 | " | 11.39 | 14.50 |
| 1907 | " | 12.53 | 16.08 |
| 1908 | " | 3.21 | 4.06 |
| 1909 | " | 5.09 | 5.71 |
| 1910 | " | 5.12 | 6.25 |
| 1911 | " | .94 | 1.08 |
| 1912 | " | 1.00 | 1.31 |
| 1910 | Ayrshires | 1.94 | 1.75 |
| 1912 | " | 5.37 | 5.89 |
| 1909 | South Devons | 6.89 | 7.03 |
| 1910 | " | 12.03 | 13.06 |
| 1911 | " | 2.64 | 3.25 |
| 1912 | " | 7.92 | 8.39 |
| 1913 | " | 3.01 | 3.75 |
| 1914 | " | 10.50 | 11.00 |
| 1915 | " | 3.22 | 4.16 |
| 1907 | Kerries | 3.40 | 3.19 |
| 1908 | Kerries and Dexters | 6.89 | 7.09 |
| 1909 | Kerries | 2.75 | 2.64 |
| 1911 | " | 1.21 | .96 |
| 1913 | " | 5.94 | 6.10 |
| 1914 | Holsteins | 1.20 | 1.69 |
| 1915 | " | 3.50 | 4.00 |

† Does not include the fat of Guernsey Heifers competing in the Tests.

BUTTER TESTS—SHORTHORNS.

| No. in Catalogue | Exhibitor and Name of Cow. | Date of Birth | Date of last Calf | No. of Days in milk | | | Milk Yield | | | Butter Yield Ratio, viz., lbs. milk to lbs. butter | Colour and Quality of Butter | | No. of Points for butter | No. of Points for Lactation | Total number of Points | Awards. | | | | | | | |
|------------------|--|----------------|-------------------|---------------------|-------|-------|-------------------------|--------|---------|---|------------------------------|-----|--------------------------|-----------------------------|------------------------|---------|---|----|----|----|------------------|----|-----------|
| | | | | Morn. | Even. | Total | lbs ozs lbs ozs lbs ozs | Colour | Quality | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Earl of Derby's Kingsthorpe Brunette 4th | Feb. 28, 1909 | Sept. 5 | 45 | 24 | 5 | 20 | 6 | 44 | 11 | 1 | 34 | 36 | 20 | 19 | 75 | 0 | 50 | 20 | 25 | Special Prize £5 | | |
| 4 | Robert L. Mond's Marian 4th | Mar. 16, 1908 | Oct. 4 | 16 | 32 | 11 | 27 | 10 | 60 | 5 | 1 | 34 | 50 | 13 | 19 | 25 | — | — | — | 19 | | 25 | |
| 5 | Robert L. Mond's Fair Rosamond | Sept. 1, 1910 | Sept. 3 | 47 | 28 | 11 | 27 | 8 | 56 | 3 | 1 | 74 | 37 | 85 | 23 | 75 | 0 | 70 | 24 | 45 | | | |
| 6 | Robert L. Mond's Rosamond Queen | May 10, 1908 | Sept. 22 | 28 | 29 | 2 | 26 | 0 | 55 | 2 | 0 | 8 | 10 | 25 | 8 | 0 | — | — | — | — | | 8 | 0 |
| 10 | R. W. Hobbs & Sons' Melody 13th | Mar. 11, 1909 | Sept. 9 | 41 | 32 | 0 | 28 | 0 | 60 | 0 | 1 | 44 | 46 | 26 | 20 | 75 | 0 | 10 | 20 | 85 | | | |
| 11 | John Lucas' Barmington Rose 3rd | Mar. 16, 1909 | Sept. 22 | 28 | 24 | 6 | 23 | 0 | 47 | 6 | 1 | 74 | 31 | 92 | 23 | 75 | — | — | — | — | | 23 | 75 |
| 13 | Capt. G. J. Buxton's Leazow Musical | May 31, 1910 | Oct. 5 | 15 | 29 | 11 | 26 | 8 | 56 | 3 | 1 | 0 | 56 | 19 | 16 | 0 | — | — | — | — | 16 | 0 | |
| 17 | Thos. Simpson's Haynes Lilly | Mar. 14, 1910 | Aug. 1 | 80 | 26 | 0 | 26 | 0 | 52 | 6 | 0 | 154 | 54 | 56 | 15 | 25 | 4 | 00 | 19 | 25 | — | — | |
| 18 | J. L. Shirley's Sweet Rush ... | April 15, 1910 | Sept. 16 | 34 | 26 | 0 | 24 | 10 | 50 | 10 | 1 | 5 | 38 | 37 | 21 | 00 | — | — | — | — | 21 | 00 | |
| 20 | James Sheppy's Chewton Mossrose 4th | Dec. 6, 1911 | Oct. 1 | 19 | 23 | 6 | 24 | 3 | 47 | 9 | 0 | 124 | 62 | 12 | 12 | 25 | — | — | — | — | 12 | 25 | |
| 32 | Sam S. Raingill's Liberty ... | 1909 | Sept. 12 | 38 | 37 | 13 | 31 | 14 | 69 | 11 | 2 | 114 | 25 | 78 | 43 | 25 | — | — | — | — | 43 | 25 | 2nd Prize |
| 34 | Sam S. Raingill's Lizzie ... | 1910 | Sept. 10 | 40 | 24 | 3 | 24 | 2 | 43 | 5 | 2 | 154 | 16 | 27 | 47 | 50 | — | — | — | — | 47 | 50 | 1st Prize |

BUTTER TESTS—SHORTHORNS—Continued.

| No. in Catalogue | Exhibitor and Name of Cow | Date of Birth | Date of last Calf | No. of days in milk | Milk Yield. | | Butter Yield Ratio, viz., lbs. milk to lbs. butter | Colour and Quality of Butter | | No. of Points for butter | No. of Points for lactation | Total number of Points | Awards |
|------------------|---------------------------------------|----------------|-------------------|---------------------|-------------------------|----------------------|---|------------------------------|---------|--------------------------|-----------------------------|------------------------|-----------|
| | | | | | Morn. | Even. Total | | Colour | Quality | | | | |
| | | | | | lbs ozs lbs ozs lbs ozs | | | | | | | | |
| 36 | J. A. Chapman & Son's Lane-side Pearl | 6 years | 1915 Sept. 30 | 20 | 33 | 329 062 32 | 94 24 12 | — | — | 41.25 | — | 41.25 | H.C. |
| 40 | James Sheppy's Model Lily 2nd | April 20, 1909 | Aug. 20 | 61 | 33 | 036 369 31 | 104 41 38 | — | — | 26.75 | 2.10 | 28.85 | |
| 41 | J. Moffat's Fillpail ... | Unknown | Sept. 18 | 32 | 29 | 222 13 51 152 10 1/2 | 19 44 | — | — | 42.75 | — | 42.75 | 3rd Prize |
| 42 | J. Moffat's Daisy ... | Unknown | Sept. 15 | 35 | 30 | 525 555 102 1 | 26 97 | — | — | 33.00 | — | 33.00 | |
| 44 | J. W. Astley's Southfield Edna | Unknown | Oct. 2 | 18 | 25 | 623 048 61 | 13 1/2 26 24 | — | — | 29.50 | — | 29.50 | |
| 47 | F. Long's Mary ... | June 20, 1910 | Mar. 3 | 23 | 33 | 1122 856 31 | 34 46 70 | — | — | 19.25 | 12.00 | 31.25 | |
| 49 | G. B. Nelson & Son's Molly ... | 6 years | Sept. 16 | 34 | 30 | 024 054 00 | 15 1/2 55 74 | — | — | 15.50 | — | 15.50 | |
| 51 | J. L. Shirley's Silvertown Verona | 6 years | Sept. 28 | 22 | 29 | 1328 1158 82 | 10 22 24 | — | — | 42.00 | — | 42.00 | H.C. |
| 66 | John Evens' Burton Millicent | March, 1907 | Aug. 15 | 66 | 31 | 027 1058 101 | 13 1/2 31 53 | — | — | 29.75 | 2.60 | 32.35 | |
| 67 | John Evens' Burton Lovely ... | March, 1909 | May 27 | 146 | 25 | 521 1147 01 | 7 32 70 | — | — | 23.00 | 10.60 | 33.60 | |

BUTTER TESTS—SHORTHORNS—Continued.

| No. in Catalogue. | Name of Cow | CHURNING—TIME AND TEMPERATURE. | | | | |
|-------------------|------------------------------|--------------------------------|-------------------|----------------------|-----------------------|------------------------------------|
| | | Time | | Duration of Churning | Temperature | |
| | | Churning began | Churning finished | | Dairy Cream and Churn | Buttermilk, when churning finished |
| | | | | Minutes | Degrees | Degrees |
| 1 | Kingsthorpe Brunette 4th ... | 9 55 a.m. | 10 45 a.m. | 55 | 63 | 59 |
| 4 | Marian 4th ... | 10 0 " | 10 55 " | 55 | 63 | 60 |
| 5 | Fair Rosamond ... | 10 5 " | 11 30 " | 85 | 63 | 60 |
| 6 | Rosamond Queen ... | 10 0 " | 11 10 " | 75 | 63 | 62 |
| 10 | Melody 13th ... | 10 0 " | 11 20 " | 80 | 63 | 58 |
| 11 | Barmpton Rose 3rd ... | 10 20 " | 11 15 " | 55 | 65 | 58 |
| 13 | Leazow Musical ... | 10 40 " | 12 10 p.m. | 90 | 64 | 60 |
| 17 | Haynes Lilly ... | 10 35 " | 11 30 a.m. | 55 | 65 | 58 |
| 18 | Sweet Rush ... | 11 40 " | 12 35 p.m. | 55 | 65 | 59 |
| 20 | Chewton Mossrose 4th ... | 11 45 " | 12 50 " | 65 | 65 | 58 |
| 32 | Liberty ... | 11 55 " | 12 50 " | 55 | 65 | 59 |
| 34 | Lizzie ... | 11 45 " | 12 8 " | 23 | 65 | 56 |
| 36 | Laneside Pearl ... | 11 55 " | 12 5 " | 110 | 65 | 58 |
| 40 | Model Lily 2nd ... | 12 15 p.m. | 12 56 " | 41 | 65 | 60 |
| 41 | Filipail ... | 12 23 " | 1 5 " | 42 | 65 | 58 |
| 42 | Daisy ... | 12 35 " | 2 3 " | 98 | 65 | 58 |
| 44 | Southfield Edna ... | 12 45 " | 2 0 " | 75 | 65 | 57 |
| 47 | Mary ... | 12 50 " | 2 3 " | 73 | 65 | 57 |
| 49 | Molly ... | 1 20 " | 3 0 " | 100 | 65 | 57 |
| 51 | Silverton Verona ... | 1 35 " | 2 0 " | 25 | 64 | 58 |
| 66 | Burton Millicent ... | 1 27 " | 2 10 " | 43 | 64 | 56 |
| 67 | Burton Lovely ... | 2 0 " | 3 30 " | 90 | 64 | 60 |

BUTTER TESTS—JERSEYS.

| No. in Catalogue | Exhibitor and Name of Cow | Date of Birth | Date of last Calf | No. of Days in milk | Milk yield in 24 hrs. | Butter Yield | Ratio, viz., lbs. milk to lbs. butter. | Colour and Quality of Butter | No. of Points for butter | No. of Points for period of Lactation | Total number of Points | Awards |
|------------------|-------------------------------------|----------------|-------------------|---------------------|-----------------------|--------------|--|------------------------------|--------------------------|---------------------------------------|------------------------|--------------------------------------|
| | | | 1915 | | lbs ozs lbs ozs | | | | | | | |
| 74 | A. Miller-Hallett's My Pallas .. | Sept. 22, 1910 | July | 4108 | 39 15 2 0 | 19 51 | Good | V.Gd. | 32.75 | 6.80 | 39.55 | Certificate of Merit |
| 75 | Mrs. Bradish-Ellames's Marcella .. | April 25, 1910 | April | 2917 | 41 14 1 11 | 24.36 | Very Good | | 27.50 | 12.00 | 39.50 | Certificate of Merit |
| 80 | J. Carson's Devon Cream ... | June 3, 1908 | Sept. 20 | 3032 | 10 1 7 | 21.97 | Good | V.Gd. | 23.75 | Nil. | 23.75 | — |
| 81 | J. Carson's Speckled Hips Yosan... | Feb. 7, 1910 | Aug. 4 | 7723 | 5 1 8 | 18.87 | Good | | 24.00 | 3.70 | 27.70 | — |
| 83 | J. Carson's Miriam's Golden Maid | July 1, 1911 | Sept. 25 | 2525 | 12 1 10 | 15.69 | Good | V.Gd. | 26.25 | Nil. | 26.25 | — |
| 84 | W. M. Jackson's Pretty Victress ... | Nov. 6, 1910 | May 28 | 14533 | 4 1 14 | 17.96 | V.Gd. | Ex. | 30.50 | 10.50 | 41.00 | 3rd Prize. E.J.C.S. Bronze Medal. |
| 85 | J. H. Smith-Barry's Marnet ... | July 11, 1908 | June 11 | 14136 | 7 2 1 | 17.53 | V.Gd. | Ex. | 33.25 | 10.10 | 43.35 | 2nd Prize. E.J.C.S. Silver Medal. |
| 87 | J. H. Smith-Barry's Marionette ... | Oct. 3, 1904 | April 26 | 17740 | 2 2 5 | 17.35 | V.Gd. | Ex. | 37.00 | 12.00 | 49.00 | 1st Prize. E.J.C.S. Gold Medal. |
| 88 | J. H. Smith-Barry's Cayenne ... | Jan. 8, 1911 | Mar. 28 | 20631 | 13 1 7 | 21.43 | Good | | 23.75 | 12.00 | 35.75 | Certificate of Merit |
| 90 | W. M. Jackson's Jolly Tidy ... | Feb. 20, 1913 | May 18 | 15522 | 8 1 2 | 19.72 | Good | | 18.25 | 11.50 | 29.75 | — |

BUTTER TESTS—JERSEYS—Continued.

| No. in Catalogue | Name of Cow | CHURNING—TIME AND TEMPERATURE. | | | | | |
|------------------|-----------------------------|--------------------------------|----------------------|-------------------------|---------|-----------------------|--|
| | | Time | | Temperature | | | |
| | | Churning began | Churning finished | Duration of Churning | Dairy | Cream and Churn | Buttermilk, when churn- ing finished |
| | | | | Minutes | Degrees | Degrees | Degrees |
| 74 | My Pallas | 8 43 a.m. | 9 22 a.m. | 39 | 58 | 52 | 58 |
| 75 | Marcella | 8 53 " | 9 20 " | 27 | 61 | 52 | 58 |
| 80 | Devon Cream | 8 52 " | 9 18 " | 26 | 60 | 52 | 56 |
| 81 | Speckled Hips Yoson | 8 48 " | 9 31 " | 43 | 59 | 52 | 56 |
| 83 | Miriam's Golden Maid | 9 54 " | 10 25 " | 31 | 63 | 52 | 56 |
| 84 | Pretty Victress | 9 39 " | 10 30 " | 51 | 62 | 52 | 57 |
| 85 | Mammet | 8 58 " | 9 36 " | 38 | 61 | 52 | 56 |
| 87 | Marionette | 8 56 " | 9 20 " | 24 | 61 | 52 | 59 |
| 88 | Cayenne | 8 55 " | 9 30 " | 35 | 61 | 52 | 58 |
| 90 | Jolly Tidy | 8 51 " | 9 25 " | 34 | 60 | 52 | 58 |

BUTTER TESTS—OTHER BREEDS.

| No. in Catalogue | Exhibitor and Name of Cow | Date of Birth | Date of last Calf | Days in Milk | Milk Yield | | | Butter Yield lbs ozs lbs ozs | Ratio, viz., lbs. Milk to lbs. Butter | Colour and Quality of Butter. | | No. of Points for Butter | No. of Points for Lactation | Total number of Points | Awards |
|------------------|--|---------------|-------------------|--------------|------------------|------------------|------------------|---------------------------------|--|-------------------------------|-------------|--------------------------|-----------------------------|------------------------|-----------|
| | | | | | Morn. lbs ozs | Even. lbs ozs | Total lbs ozs | | | Colour | Quality | | | | |
| 100 | J. F. Remnant's Treacle 3rd | Jan. 14, 1909 | May 1915 | 24 | 19 | 5 16 | 8 35 | 13 1 | 61 | 25 47 | — | 22 50 | 10 90 | 33 40 | 2nd Prize |
| 101 | J. F. Remnant's Don-nington Jane | Nov. 14, 1909 | April 17 | 186 | 17 | 3 12 | 0 29 | 3 1 | 43 | 22 51 | — | 20 75 | 12 00 | 32 75 | H.C. |
| 104 | H. Fitzwater Plum-petre's Rosey 11th | July 13, 1907 | July 18 | 94 | 17 | 2 13 | 11 30 | 13 1 | 131 | 16 85 | — | 29 25 | 5 40 | 34 65 | 1st Prize |
| 105 | H. Fitzwater Plum-petre's Donnington Juno | Oct. 8, 1909 | July 8 | 104 | 20 | 13 16 | 11 37 | 8 1 | 11 | 22 28 | — | 27 00 | 6 40 | 33 40 | H.C. |
| 107 | A. W. Bailey Hawkin's Susan of Stagenhoe | 8½ years | Sept. 30 | 20 | 17 | 0 15 | 0 32 | 0 0 | 144 | 35 93 | — | 14 25 | — | 14 25 | — |
| 108 | A. W. Bailey Hawkin's Stagenhoe Rose of Gold | Nov. 20, 1910 | June 16 | 126 | 16 | 11 14 | 11 31 | 6 1 | 41 | 24 49 | — | 20 50 | 8 60 | 29 10 | H.C. |
| 109 | A. W. Bailey Hawkin's Merton Dairymaid 4th | Aug. 1, 1911 | Aug. 18 | 63 | 20 | 6 16 | 5 36 | 11 1 | 144 | 19 08 | — | 30 75 | 2 30 | 33 05 | H.C. |
| 116 | Kenneth M. Clark's Sudbourne Queensa | June 12, 1910 | Sept. 19 | 31 | 27 | 10 24 | 14 52 | 8 | — | — | Unchurnable | — | — | — | — |
| 131 | W. & H. Whitley's Mayflower 28th | Nov. 10, 1904 | Sept. 11 | 39 | 27 | 5 25 | 13 53 | 21 | 83 | 34 67 | — | 24 50 | — | 24 50 | — |
| 132 | W. & H. Whitley's Helwill Hilda | April, 1910 | Aug. 22 | 59 | 17 | 10 12 | 10 30 | 4 0 | 9 | 53 78 | — | 9 00 | 1 90 | 10 90 | — |
| 134 | Page and Whitley's Butterfly 9th | June 3, 1911 | Sept. 20 | 30 | 25 | 2 21 | 2 46 | 4 1 | 21 | 40 55 | — | 18 25 | — | 18 25 | — |
| 147 | A. & J. Brown's Flower | June 27, 1909 | Oct. 3 | 17 | 32 | 10 30 | 8 63 | 2 1 | 14 | 33 66 | — | 30 00 | — | 30 00 | — |
| 149 | W. & R. Wallace's Toddington Princess | Unknown | Aug. 17 | 64 | 36 | 13 34 | 14 71 | 11 1 | 10 | 44 11 | — | 26 00 | 2 40 | 28 40 | — |

BUTTER TESTS—JERSEYS—Continued.

| No. in Catalogue | Name of Cow | CHURNING—TIME AND TEMPERATURE. | | | | | |
|------------------|-----------------------------|--------------------------------|----------------------|-------------------------|---------|-----------------------|--|
| | | Time | | Temperature | | | |
| | | Churning began | Churning finished | Duration of Churning | Dairy | Cream and Churn | Buttermilk, when churn- ing finished |
| | | | | Minutes | Degrees | Degrees | Degrees |
| 74 | My Pallas | 8 43 a.m. | 9 22 a.m. | 39 | 58 | 52 | 58 |
| 75 | Marcella | 8 53 " | 9 20 " | 27 | 61 | 52 | 58 |
| 80 | Devon Cream | 8 52 " | 9 18 " | 26 | 60 | 52 | 56 |
| 81 | Speckled Hips Yoson | 8 48 " | 9 31 " | 43 | 59 | 52 | 56 |
| 83 | Miriam's Golden Maid | 9 54 " | 10 25 " | 31 | 63 | 52 | 56 |
| 84 | Pretty Victress | 9 39 " | 10 30 " | 51 | 62 | 52 | 57 |
| 85 | Mammet | 8 58 " | 9 36 " | 38 | 61 | 52 | 56 |
| 87 | Marionette | 8 56 " | 9 20 " | 24 | 61 | 52 | 59 |
| 88 | Cayenne | 8 55 " | 9 30 " | 35 | 61 | 52 | 58 |
| 90 | Jolly Tidy | 8 51 " | 9 25 " | 34 | 60 | 52 | 58 |

BUTTER TESTS—OTHER BREDS.

| No. in Catalogue | Exhibitor and Name of Cow | Date of Birth | Date of last Calf | Days in Milk | Milk Yield | | | Butter Yield | Ratio, viz. lbs. Milk to lbs. Butter | Colour and Quality of Butter. | | No. of Points for Butter | No. of Points for Lactation | Total number of Points | Awards | |
|------------------|--|------------------------|-------------------|--------------|------------|-------|-------|--------------|--------------------------------------|-------------------------------|-------------|--------------------------|-----------------------------|------------------------|--------|-----------|
| | | | | | Milk Yield | | | | | Butter Yield | Colour | | | | | Quality |
| | | | | | Morn. | Even. | Total | | | | | | | | | |
| | | | | | lbs | ozs | lbs | ozs | lbs | ozs | | | | | | |
| 100 | J. F. Remnant's Treacle 3rd | Jan. 14, 1909 | 1915 May | 24 | 19 | 5 16 | 8 35 | 13 1 | 6 1 | 25 47 | — | — | 22 50 | 10 90 | 33 40 | 2nd Prize |
| 101 | J. F. Remnant's Donnington Jane | Nov. 14, 1909 | April 17 | 186 | 17 | 3 12 | 0 29 | 3 1 | 4 3 | 22 51 | — | — | 20 75 | 12 00 | 32 75 | H. C. |
| 104 | H. Fitzwalter Plump-tre's Rosey 11th | July 13, 1907 | July 18 | 94 | 17 | 2 13 | 11 30 | 13 1 | 13 1 | 16 85 | — | — | 29 25 | 5 40 | 34 65 | 1st Prize |
| 105 | H. Fitzwalter Plump-tre's Donnington Juno | Oct. 8, 1909 | July 8 | 104 | 20 | 13 16 | 11 57 | 8 1 | 11 | 22 28 | — | — | 27 00 | 6 40 | 33 40 | H. C. |
| 107 | A. W. Bailey Hawkin's Susan of Stagenhoe | 8½ years | Sept. 30 | 20 | 17 | 0 15 | 0 32 | 0 0 | 14 1 | 35 93 | — | — | 14 25 | — | 14 25 | |
| 108 | A. W. Bailey Hawkin's Stagenhoe Rose of Gold | Nov. 20, 1910 | June 16 | 126 | 16 | 11 14 | 11 31 | 6 1 | 4 1 | 24 49 | — | — | 20 50 | 8 60 | 29 10 | H. C. |
| 109 | A. W. Bailey Hawkin's Merton Dairymaid 4th | Aug. 1, 1911 | Aug. 18 | 63 | 20 | 6 16 | 5 36 | 11 1 | 14 1 | 19 08 | — | — | 30 75 | 2 30 | 33 05 | H. C. |
| 116 | Kenneth M. Clark's Sudbourne Queena | June 12, 1910 | Sept. 19 | 31 | 27 | 10 24 | 14 52 | 8 | — | — | Unchurnable | — | — | — | — | |
| 131 | W. & H. Whitley's Mayflower 28th | Nov. 10, 1904 | Sept. 11 | 39 | 27 | 5 25 | 13 53 | 2 1 | 8 1 | 34 67 | — | — | 24 50 | — | 24 50 | |
| 132 | W. & H. Whitley's Helwill Hilda | April, 1910 | Aug. 22 | 59 | 17 | 10 12 | 10 30 | 4 0 | 9 | 53 78 | — | — | 9 00 | 1 90 | 10 90 | |
| 134 | Page and Butterfly 9th | Whitley's June 3, 1911 | Sept. 20 | 30 | 25 | 2 21 | 2 46 | 4 1 | 2 1 | 40 55 | — | — | 18 25 | — | 18 25 | |
| 147 | A. & J. Brown's Hedges Flower | June 27, 1909 | Oct. 3 | 17 | 32 | 10 30 | 8 63 | 2 1 | 14 | 33 66 | — | — | 30 00 | — | 30 00 | |
| 149 | W. & R. Wallace's Toddington Princess | Unknown | Aug. 17 | 64 | 36 | 13 34 | 14 71 | 11 1 | 10 | 44 11 | — | — | 26 00 | 2 40 | 28 40 | |

BUTTER TESTS—OTHER BREEDS.

| No. in Catalogue | Name of Cow | CHURNING—TIME AND TEMPERATURE. | | | | | |
|------------------|------------------------------|--------------------------------|-------------------|----------------------|------------|-----------------|------------------------------------|
| | | Time | | Temperature | | | |
| | | Churning began | Churning finished | Duration of Churning | Dairy | Cream and Churn | Buttermilk, when churning finished |
| 100 | Treacle 3rd | 2 10 p.m. | 3 5 p.m. | Minutes 55 | Degrees 64 | Degrees 52 | Degrees 60 |
| 101 | Donnington Jane | 2 25 " | 3 0 " | 35 | 64 | 52 | 58 |
| 104 | Rosey 11th... .. | 2 30 " | 3 30 " | 60 | 64 | 52 | 53 |
| 105 | Donnington Juno | 2 39 " | 3 30 " | 60 | 64 | 52 | 62 |
| 107 | Susan of Stagenhoe | 2 40 " | 3 30 " | 50 | 64 | 52 | 58 |
| 108 | Stagenhoe Rose of Gold... .. | 2 35 " | 3 19 " | 44 | 64 | 52 | 60 |
| 109 | Merton Dairymaid 5th | 2 50 " | 3 50 " | 60 | 64 | 52 | 60 |
| 116 | Sudbourne Queensa | 3 0 " | 6 0 " | 180 | 64 | 52 | — |
| 131 | Mayflower 28th | 3 19 " | 4 20 " | 61 | 64 | 52 | 53 |
| 132 | Helwill Hilda | 3 15 " | 3 50 " | 35 | 64 | 52 | 60 |
| 134 | Butterfly 9th | 3 25 " | 4 40 " | 75 | 64 | 52 | 62 |
| 147 | Hedges Flower | 3 50 " | 4 45 " | 55 | 64 | 52 | 62 |
| 149 | Toddington Princess | 4 0 " | 4 50 " | 50 | 64 | 52 | 60 |

THE POULTRY SECTION.

By JOSEPH PETTIPHER, Woodway House, near Banbury.

Tempus fugit—and my memory for some things doesn't improve—but I well recollect the institution of poultry classes at the Dairy Show and how it came to be looked upon as a leading classic for birds of the year when the famous old Oxford fixture fell into abeyance; but when I try to think how many years it has been my pleasure to see the Dairy Show without a break, that aforesaid memory is somewhat unreliable. Anyhow, it's considerably more than a score, which is surely enough for the purpose of making a mental comparison as to the progress and changes that have taken place in this ever-increasing industry. I write "industry" advisedly, because, no matter what phase of poultry keeping you look at, be it the fancier or utilityite—to sum up all the various branches under those two heads—it is an industry either in one way or another, an improvement in quality and productiveness aimed at in various ways, but all verging to one end, viz., the improvement of the British denizens of the poultry yard. These are days of rapid progress in the matter of utility poultry culture both for eggs and meat; but we must not forget that it was the fancier and the exhibitor who introduced and improved new breeds which but for him would not have been in existence for the utility breeder to lay hold of. Take the ubiquitous Wyandottes as an example. I recollect the sensation caused by their first introduction from America. The British fancier took them up in a semi-fixed condition, bred them carefully for a number of years, till they have become one of the most useful utility breeds of the day, and so we may say of almost any now popular variety from the Cochins and Brahmas, which came forward in the "fifties" and "sixties," and which did so much towards the foundation of so many subsequent improvements down to that latest new comer, the Russian Orloff, which is just now attracting so much attention in consequence of the claims put forward for it by its admirers as a combination of desirable utility virtues. Again, if you take the Orpingtons, a purely English-made variety from the outset, started by their originator as a utility breed, no one will, I think, attempt to deny that but for the fancier and exhibitor they would never have reached the stage of useful perfection in which we find them to-day. This was undoubtedly realised by their introducer, for there was no keener or more successful exhibitor than the late William Cook. Well then, if we are to admit that the exhibitor has done his share in advancing the status of the poultry we find in our yards to-day, we must also acknowledge the important part which an exhibition like that annually held at Islington plays in providing the opportunity of placing the best of such breeds before the public, providing them with ample opportunity to see

where their own stocks fail, and procure improved sires at reasonable prices from the selling classes, whilst the more competent breeder and exhibitor also finds advantage by comparison with others, and in the many other ways which only can be secured by a show of this description. Need more be said to justify the Council of the British Dairy Farmers' Association in continuing their annual show, even in this critical era of our national history? Rather I think we may say there is more than usual justification for it, seeing the exigencies of our Army and Navy have made the Crystal Palace and Birmingham Shows an impossibility, and on top of that the enormously increased necessity for increased home production of eggs and table fowls, which is so obviously a desirable necessity at the present time.

I feel sure in my own mind that the British Dairy Farmers' Association's executive realise this and that they will leave no stone unturned to encourage it in the future on up-to-date lines as they have done in the past; for there never was a time so much as the present one when the advantages to be derived from an exhibition of the up-to-date young stock of the year were so obvious a necessity as the present, and nowhere where this can be better done than at the Dairy Show.

Casting my mind back over the 1915 show, one or two things strike me as notable features of the year and the times in which we live. One of these is the remarkable change which has come over the class of the majority of those who visited the show and the objects which drew them thither, a change I attribute mainly to two causes—the absence of so many of those who were previously present on war duties, and the daily increasing number of people who are in various ways taking up poultry culture as a desirable national asset erstwhile profitable to themselves. True, one saw still a goodly number of the old fancier type, but it was easy to observe that the great bulk of what one may term ordinary visitors were there to see what could be learned as to the best breed likely to suit their purpose from a useful standpoint, and to pick up wrinkles in the various methods of modern culture that were provided by the vast array of appliances of all descriptions which can always be seen on the manufacturers' stands. This trend, too, was equally to be noted in the entries; those breeds which give the nearest approach to either heavy laying or the best combination of eggs and table fowls are those most heavily exhibited. This trend of popular opinion may be, and doubtless is, correct to a certain extent. We live in an age of progress, and it follows that if we poultry breeders have been progressive, our more modern varieties ought to be improvements, but it does not any the more necessarily follow that some of the older ones deserve to be set back as more or less obsolete and out of date. No one breed is best for everybody, and it may very well be that there are amongst some of the old standards some that for certain conditions deserve more attention than they get in the general rush for the more modernly popular varieties. However, be this as it may, the fact was obvious that if at almost any time during the show you wanted to look at such classes as the Dorkings, Houdans, Asiatics, Old English Game, &c., you could almost have the space to yourself; whereas if you passed

on to the Sussex, Rhode Island Reds, White Wyandottes, White Leghorns, Orpingtons, Orloffs, Buttercups, &c., you noticed them besieged by a constant bevy of inspecting visitors. Possibly a notable exception in the older breeds was the Plymouth Rock section. Here barred, buff, and white, all three, seemed to well hold their own in the attention they attracted both from fanciers and the general public.

Another feature, one on which possibly I ought to speak with more diffidence, as being more difficult to correctly diagnose, but, nevertheless, one on which I came away strongly imbued with a notion derived from a general survey during the first three days of the four on which the Show was open, was that, despite the rapid advance in the interest manifest in poultry breeding, there seemed to be a decreasing interest in artificial methods of hatching and rearing, and consequently a greater inclination to take up or return to natural methods. The breeder of large numbers—either for rearing or for sale as “day olds”—must necessarily depend greatly on artificial methods. It is not to such as these that I refer, but to the ordinary person who is one of the many thousands who keep a few fowls of one breed or crossbreds in the ordinary way, and to the agriculturist who is now so much more than formerly giving the poultry section of his farm serious attention. Of these I gathered, both by observation and conversation, that, so far as it was possible for one individual to observe, there was a decided leaning to turn more to natural methods and take less interest in the artificial section than has been the case of late years. I feel it an honour to be asked to contribute the poultry article to this Journal, but I also feel that the times are exceptional, and that something of a general summary of the circumstances pertaining to the individual 1915 Show is more desirable than a review of the classes *seriatim*—hence the foregoing rambling notes—but before I close up with a run over the different varieties I should like to remark how well it augurs for the future prosperity of poultry culture in Great Britain that even whilst this terrible War is at its height and so many of those who used to exhibit have either disposed of their stocks or reduced them to breeding only, and for the nonce discontinued showing, there are still to be found 2,647 entries of high class poultry exhibited at the Dairy Show—only a casual variation of less than 450 pens less than in 1914. And certainly I do not think anyone who has annually visited this event would for a moment object to admit that the general quality was equal to anything ever seen at any previous show.

Turning up the catalogue, the table section provided another instance of the inclination of a large section of the visitors, for it was kept under constant observation by large numbers of people. The “Special” classes confined to the exhibits of Farmers and Cottagers, being *bonâ fide* rearers of chickens fed under natural conditions, not crammed or caponised, seemed particularly to attract attention and deservedly so. The classes for eggs are evidently a comparatively new feature that is gaining in favour, for entries were 14 in excess of 1914. Seeing I judged these, I may, perhaps, be allowed to make a suggestion. I think it would be well to extend the classes to three instead of two,

so that Brown and Tinted need not compete together. I fully believe the increased entry of probably both, and certainly Tinted, which latter compete at a disadvantage against the deeper colour, would justify it. The Dorkings were well up to any I recollect in quality, but one wonders what will happen when the old breeds drop out, for practically every exhibit bears a familiar name. And much the same may be said of the "Club Type" Langshans, whereas the "Croods" are stronger classes and apparently more popular with the general poultry keeper.

Brahmas and Cochins may be classed with Dorkings—quality but not quantity and an absence of new supporters. Then we come to the Sussex. All four colours seem to be about equally popular. The more recently standardized Browns, though not more largely shown than the others, were, I thought, quite as much looked after. The Sussex as a breed is evidently built on a very sound foundation and likely to continue a very general favourite. I was sorry to see so few Houdans. As a non-sitting combination of layer and table fowl, quite apart from their attractive fancy points, they deserve every consideration. And the cockerels are amongst the most valuable for crossing purposes. Faverolles were just fair, but not progressive in quality or numbers. Campines about held their own; the Golds never seem as popular as the Silvers, though, I believe, there is little, if any, difference in laying properties.

The Wyandotte section produced a striking example of how greatly a breed suffers in popularity eventually if it is one in which "double mating" is an essential. The silvers and golds get less in entries and interest; whilst the whites, where double mating is not essential, increase and multiply. I was glad to see the buffs looking up again after almost having disappeared; they deserve well of breeders' attention. Partridges have gone down very much, another instance of ruin through the adoption of a double-mating standard. Orpingtons—buff and white—never seem to fade either in quality or general favour. Blacks about hold their own. Blues were fairly full classes, but I fear interest is waning in this colour. Jubilees and spangles make up the variety classes; both are good sound breeds and one can only be surprised they are not more largely kept and exhibited.

The Rhode Island Reds are, undoubtedly, one of the most popular breeds of the day and, as far as it is possible to judge, one of the most likely to last. The show of both single and rosecombs was of as good quality as any I have ever seen, taken as a whole. They were followed by the newly introduced here (but not new to their native country) Russian Orloffs. So fresh on English soil, large classes were not to be expected, but it was obvious a number of people were bent on "taking stock," for their pens were a constant source of attraction; and several times, presumably because I wore a judge's badge, I was asked by people quite unknown to me to direct them to the Orloffs. They are evidently rapidly becoming very popular. At present the two colours recognised and classified are mahogany and spangled.

Anconas, to my view, presented a pleasing feature, inasmuch as there is evidently a return to more nearly approach the original type and colour. At one time they were bred much too dark and too nearly like a black Leghorn. The real Ancona should be of a very distinct type from any other Mediterranean variety. Hamburgs maintain their quality, but their numbers are small compared with bygone days.

Black Sumatra Game are an unique and attractive breed, with some very good properties generally. Why so little shown appears a matter for surprise; and I also wondered that that grand old breed the Old English Game, which had four classes allotted to it, was not more largely supported. Minorcas hold on well in quality and quantity, as do the Andalusians and various colours of Leghorns. These breeds are old standards that always come along smiling in company with the cosmopolitan Plymouth Rock, which in barred, buff, and white ever maintains a deservedly high degree of favour. A feature this year was the introduction of specially subscribed cups for both sexes of the barred variety, which were awarded for type only, and by a separate judge, the outcome of a laudable effort to regain a certain amount of the original and desirable type said to have been lost by breeders of late years whilst striving after a given style of marking. Of the other breeds classified, Indian Game were perhaps most conspicuous, and we found some typical specimens of such good old breeds as Modern Game, Black Spanish, Creve Cœur, and Redcaps in the Any Other Variety classes, though why Malines and La Bresse have dropped down to just one or two in these classes in these utility days it is difficult to conceive. The breeding pens were, as usual, a great centre of attraction. The fact that for the second year in succession the class for feather-legged birds had to be cancelled, whilst large entries and increased interest was manifested in many of the clean-legged pens, was another sign of the trend of modern favour. The Waterfowl section made a brave show of itself. Here again in ducks the modern favourites hold sway much to the exclusion of the older Aylesburys, Rouens, and Pekins. Geese and Turkeys were excellent. Bantams, as usual, had a large section to themselves; entries and quality generally were good. There never seems any falling-off in the interest taken in the midgets, and with some varieties one gathers there is an increasing interest being taken by many people who have realised how useful a pen of Bantams may prove to people whose space is too limited to well admit the keeping of larger varieties.

THE PIGEON SECTION.

By JOHN H. ROSS, 130, Ferme Park Road, Stroud
Green, London, N.

THAT the great World War, though in its second year, has not seriously interfered with the peaceful pursuits fostered by the Association, is amply proved by the success which attended the Pigeon Section of the 1915 Show, the results of which have fully justified the Association in taking up the bold line of "Business as usual." In spite of the many necessary restrictions placed by Government on the movement of pigeons, the entries actually showed the record number of 2,735, no less than 444 up on last year, and 71 in excess of the previous record in 1907. This result was not achieved without the loyal co-operation of exhibitors, who were most careful in complying with all official requirements. Apart from numbers, the quality of the birds generally was well maintained, as detailed below.

A warm word of thanks is due to our Past President and present Finance Chairman, Mr. S. Palgrave Page, for keeping so watchful an eye on the feathered portion of the Exhibition.

Fantails opened the schedule with the grand display of 139 pens, in 11 classes, the best, I think, they have ever done at the Dairy. In fact, they constituted a show in themselves, the quality being good all through, particularly as regards the Whites. The Silver Medal of the Association went to Pen 2680 (Geo. E. Gray), and the reserve to Pen 2768 (also Geo. E. Gray), a Red Saddle, both being most excellent specimens. There were also numerous V.H.C. and H.C. awards. The Blacks, Silvers, Reds and Yellows all deserve mention for quality, excelling previous shows in many respects, and doing every credit to their breeders.

Pouters could only muster 16 pens in one class, and although five up on last year, show a decline on former years. The quality, however, was particularly good, Pen No. 2797 (W. G. Robertson) having the distinction of carrying off the Champion Cup for the Best Bird in the Show, which, needless to say, was a grand specimen, a Blue, bred in the current year.

Pigmy Pouters numbered 148 pens in 14 classes, compared with 140 in 12 classes last year. While the majority displayed the good pigmy quality of this very charming variety, I cannot say that, taken altogether, there was any noticeable improvement upon the exhibits of last year. The Silver Medal of the Association was awarded to Pen 2863 (John MacIlvenna).

Norwich Croppers in four classes occupied 66 pens, an advance of eight on last year. This variety appears to be increasing in popularity, the colours of this very sociable bird having much improved of late.

Carriers were very disappointing, only numbering 72 in nine classes. The variety does not show improvement, the quality not being nearly so good as I have seen at the Dairy in former years. The Medal of the Association went to Pen 3055 (Frederick Meyer), a Black cock. I may here correct the wrong impression prevailing amongst the general public as to these birds being *message* carriers. Such, of course, is not the case, the bird for the purpose being the Working Homer, noticed lower down.

Barbs in 3 classes and 25 pens were good all through as to quality. Fanciers, however, do not seem to favour this variety as formerly. Pen 3097 (H. and T. K. Child) won the Fifth Challenge trophy for bird bred prior to 1914, while Pen 3103 (John T. Cowan) won the Barb Club Challenge trophy for bird bred in 1914. For a promising Red the Bronze Medal of the Association went to Pen 3112 (W. H. Edwards), bird bred in 1915.

Dragoons formed a grand collection, both in quality and numbers, a show in themselves. They ran to 447 in 36 classes, quite a record even for the Dairy, and 103 in advance of last year. Blues do not seem to make much headway, in spite of some really good birds amongst them. The Chequers hold their own well in type, &c., the Grizzles being also very good. The Reds and Yellows were a grand lot, and the Whites proved a great attraction, the condition of the birds generally being all that could be desired. I should like to see more competition, however, in the Red and Yellow, and more particularly, the White classes. A magnificent Blue Chequer cock, in a class of 30 pens, No. 3367 (W. Hunter Johnson), won the George Cotton Cup, the George Cotton Cup for *Hens* falling to Pen 3494 (R. A. and C. W. Patterson), also with a Blue Chequer, in a class of 28. The White Challenge Cup was awarded to Pen 3445 (W. E. Hewitt) with a good specimen.

Short-faced Tumblers.—These charming little birds (98 in eight classes) exceeded last year's total by 15. The adult whole feather or whole-feathered Agate, as well as the 1915 class in the same colours, were exceedingly fine, while many typical specimens were shown in other classes, which, taken as a whole, formed a nice collection. The Silver Medal of the Association fell to Pen 3630 (John W. Clelland), a good ground coloured Almond, nicely broken.

Long faced Tumblers.—This section in a very good display also improved on the 1914 Show, mustering 238 in 19 classes, an increase of 29, in the same number of classes. The judge, I think, must have experienced some difficulty in placing winners, the quality being so good throughout, and altogether a grand collection. The young classes call for special notice. The Silver Medal of the Association was won by Pen 3804 (Barnes & Atherton), with a Red self.

English Owls are not generally very numerous at the Dairy, this year numbering 40 pens in five classes, compared with 38 in five classes in 1914. The quality quite came up to the standard of birds shown here, most of the best being on exhibition. The Silver Medal was awarded to Pen 3924 (A. A. Gatty).

Foreign Ouls made a grand exhibit, numbering 131 in 15 classes, nearly double of last year's figures. The quality was good throughout. The Silver Medal of the Association was won by Pen 4049 (R. A. Briggs), a good Dun.

Turbits could only muster 17 in two classes, one class having to be cancelled. The drop from 61 entries last year must be considered very disappointing. I cannot account for the decline, as the classification is studied yearly by a careful committee. The quality of the few birds shown was distinctly good, the Esquilant Trophy going to Pen 4085 (G. M. Turner), a Chequer.

Archangels formed a very nice collection, viz., 62 pens in six classes. The quality was grand, but the judging was not assisted by the indifferent light that prevailed at the time. Pen 4132 (J. W. Edinead) was awarded the Fulton Trophy with a lovely bird.

Jacobins came along in 66 pens of six classes, making a nice exhibit. As I have stated on previous occasions, the Dairy is held rather early for these heavily feathered birds, considering which their condition was good. Pen 4173 (Miss Jeanie Harvey) won the Silver Medal with a beautiful Red.

Runts atone in size for lack of numbers. There were 14 pens in one class, all being in good condition, especially of feather, in which respect they have lately shown improvement.

Nuns made a very pretty and taking exhibit, 60 birds in three classes, compared with 38 in four classes last year. The quality was exceedingly good.

Oriental Frills numbered 138 in 11 classes, an increase of 28 on last year's total. Most of the best birds seem to have been shown, except that the principal exhibitor was not represented owing to his judging other varieties at the Show. The quality was high, most of the exhibits being awarded notice.

Modenas were well represented, there being 112 pens in eight classes, with the Guzzi exceptionally strong. This variety, with its choice of colouring, appears to be growing in popularity, their perky little ways adding to their attractiveness. The Bronze Medal of the Association fell to Pen 4501 (F. Harold Cobb), with a Guzzi hen, bred 1915.

Magpies numbered 88 pens in seven classes (2 being cancelled), compared with 48 in six classes in 1914. The judging was in the hands of possibly the best fancier of this variety, so that I should have liked to see larger entries. The quality of the birds was quite up to average.

Scandaroons had 32 pens in three classes, the same as last year. The quality and the colours were alike excellent.

Antwerps are still apparently out of favour with the fancy, only 31 against 35 last year putting in an appearance, with four classes each time.

Show Homers, although 38 less than last year, totalled 163 pens in 12 classes. The quality was very good throughout, some of the birds being of outstanding merit, many receiving notice. The coveted Silver Medal went to Pen 4797 (E. J. & W. H. Lovell) with a grand and promising Red Chequer.

Working Homers presented a record entry of 225 in six classes, showing an increase of 85 upon last year, the young cocks alone contributing no less than 82 of the total; the collection altogether forming probably the most magnificent lot ever brought together. The interest attaching to this most intelligent and useful variety attracted pigeon racers from all parts of the country, doubtless an indication of the increased popularity of the variety owing to the war. The exceptional condition of the birds generally was due to their long period of rest through having been prohibited from flying during the war. His Majesty the King again entered two birds of excellent racing type, one winning a "V.H.C." Several birds were shown that were doing Government work, and the winners generally were found to be of a racing type. No definite standard appears yet to have been evolved in this variety, but the qualities of neck, shoulder and wing that make for endurance are what undoubtedly appeal to judges at the present time. Mr. W. Curtis, himself a successful prize-winner and racer up to 500 miles, was the judge. The birds were admirably handled, the task of adjudicating amongst so large an entry of fine birds being no easy one. The winners were as follows:—

| CLASS. | ENTRIES. | PRIZE. | WINNER. |
|--|----------|-----------|--------------------------------|
| Cock or Hen, bred prior to 1915 and flown at least 100 miles | 33 | 1st & Cup | Pen 4857, Albert H. Broughton. |
| Do. do. 75 miles during 1914 ... | 16 | do. | Pen 4890, Joseph Blackburn. |
| Cock, bred prior to 1915 ... | 24 | do. | Pen 4923, J. Otway. |
| Hen, bred prior to 1915 ... | 16 | do. | Pen 4931, Joseph Stark. |
| Cock, bred in 1915 ... | 82 | do. | Pen 5013, Arthur Blackburn. |
| Hen, bred in 1915 ... | 54 | do. | Pen 5032, H. Whetton. |

Exhibition Flying Homers.—This smart looking variety numbered 64 in six classes. The quality was good and even, altogether a nice collection. The Silver Medal of the Association was won by Pen 5112 (John Brooke).

Any Other Variety in one class and 19 pens contained birds of merit. First, a Fairy Swallow, with other varieties of great beauty.

Selling Classes numbered 224 pens in 15 classes, containing birds of good value. As was expected in the circumstances, sales were low.

In concluding my report I am pleased to say that the arrangements worked satisfactorily, in spite of the unavoidable darkness of the Hall, and I have again to express my thanks to Messrs. Spratts for their ready assistance in carrying through the work, as well as to our Secretary for his kindly consideration at all times.

AWARD OF PRIZES, DAIRY SHOW, 1915.

DAIRY COWS AND HEIFERS IN MILK.

- Class 1.—SHORTHORN COWS.**—Entered in or eligible for Coates' Herd Book, or its pedigree sent for such entry previous to the Show.—*First Inspection Prize* (£10) to Robert L. Mond, Combe Bank, Sundridge, Sevenoaks, Kent, for "Rosamond Queen." *Second Inspection Prize* (£5) to Robert W. Hobbs and Sons, Kelnscott, Lechlade, for "Melody 13th." *Third Inspection Prize* (£3) and *Third Milking Trial Prize* (£3) to Capt. Gerald J. Buxton, Tockenham Manor, Wootton Bassett, Wilts, for "Leazow Musical." *First Milking Trial Prize* (Lord Desborough Cup and £10) and *Shorthorn Society's Prize* (£10) to Robert L. Mond for "Marian 4th." *Second Milking Trial Prize* (£5) to Robert L. Mond for "Fair Rosamond."
- Class 2.—SHORTHORN HEIFERS**, not exceeding three years of age.—Entered in or eligible for Coates' Herd Book.—*First Inspection Prize* (£5) and *Second Milking Trial Prize* (£3) to J. Moffat, Watercreek, Kendal, for "Natland Daisy." *Second Inspection Prize* (£3) to Robert W. Hobbs & Sons for "Bloom 17th." *First Milking Trial Prize* (£5) to Frank H. Thornton, Kingsthorpe Hall, Northampton, for "Kingsthorpe Barrington."
- Class 3.—SHORTHORN COWS.**—Not eligible for Class 1.—*First Inspection Prize* (£10) to J. L. Shirley, Silverton, Bletchley, Bucks, for "Silverton Verona." *Second Inspection Prize* (£5), *First Milking Trial Prize* (£10), the Lord O'Hagan Cup, the Barham Cup, the Shirley Cup, and the Spencer Cup to Sam S. Raingill, The Grange, Ringway, Altrincham, for "Liberty." *Third Inspection Prize* (£3) to Joseph A. Chapman & Son, Scholecroft, and Laneside, Churwell, Leeds, for "Laneside Jewel." *Second Milking Trial Prize* (£5) to Joseph A. Chapman & Son for "Laneside Pearl." *Third Milking Trial Prize* (£3) to Sam S. Raingill for "Lizzie."
- Class 4.—SHORTHORN HEIFERS**, not exceeding three years of age.—Not eligible for Class 2.—*First Inspection Prize* (£5) and *First Milking Trial Prize* (£5) to Geo. B. Nelson & Sons, Cockerham Hall, near Garstang, for "Sally." *Second Inspection Prize* (£3) to J. W. Astley, West Marton, Skipton, for "Southfield Grace."
- Class 5.—LINCOLNSHIRE RED SHORTHORN COWS.**—Entered in or eligible for the Herd Book of the Lincolnshire Red Shorthorn Association.—*First Inspection Prize* (£10) and *First Milking Trial Prize* (£10) to John Evens, Burton, near Lincoln, for "Burton Ruby Spot 11th." *Second Inspection Prize* (£5) to F. B. Wilkinson, Cavendish Lodge, Edwinstowe, for "Sherwood No. 26." *Third Inspection Prize* (£3) to Stanley Blundell, Bendish House, Welwyn, for "Bendish Bess." *Second Milking Trial Prize* (£5) to John Evens for "Burton Millicent."
- Class 6.—LINCOLNSHIRE RED SHORTHORN HEIFERS**, not exceeding three years of age.—Entered in or eligible for the Herd Book of the Lincolnshire Red Shorthorn Association.—*First Inspection Prize* (£5) and *First Milking Trial Prize* (£7) to John Evens for "Burton Ruby 18th." *Second Milking Trial Prize* (£4) to John Evens for "Burton Buttercup 5th."
- Class 7.—JERSEY COWS.**—Entered in or eligible for the Herd Book.—*First Inspection Prize* (£7) and *Third Milking Trial Prize* (£2) to A. Miller-Hallett, Goddington, Chelsfield, for "My Pallas." *Second Inspection Prize* (£4) to W. M. Jackson, Leggatts, near Potter's Bar, Middlesex, for "Pretty Victress." *Third Inspection Prize* (£2) and the Blythwood Bowl to Dr. Corner, Brook House, Southgate, for "Victoria." *First Milking Trial Prize* (£7) to J. H. Smith-Barry, Stowell Park, Wilts, for "Marionette." *Second Milking Trial Prize* (£4) to Mrs. A. G. Bradish-Flames, Manor House, Little Marlow, for "Marcella."

- Class 8—JERSEY HEIFERS, not exceeding three years of age.—Bred in Great Britain or Ireland.—Entered in or eligible for the Herd Book.—Cancelled.
- Class 9—JERSEY HEIFERS, not exceeding three years of age.—Bred in Channel Islands.—Entered in or eligible for the Jersey or English Jersey Herd Book.—*First* Inspection Prize (£5) to A. Miller-Hallett for “Cowslip 61st.” *Second* Inspection Prize (£3) to J. Carson, Crystalbrook, Theydon Bois, Essex, for “Adela of Les Ormes.” *Third* Inspection Prize (£2) to W. M. Jackson for “Jolly Tidy.”
- Class 10—GUERNSEY COWS.—Entered in or eligible for the Herd Book.—*First* Inspection Prize (£7) to A. W. Bailey Hawkins, Stagenhoe Park, Welwyn, for “Stagenhoe Rose of Gold.” *Second* Inspection Prize (£4) and *First* Milking Trial Prize (£12) to J. F. Remnant, The Grange, Twyford, Berks, for “Treacle 3rd” (8280). *Third* Inspection Prize (£2) to H. Fitzwalter Plumptre, Goodnestone Park, Canterbury, for “Rosey 11th” (7456). *Second* Milking Trial Prize (£4) to H. Fitzwalter Plumptre for “Donnington Juno” (8041). *Third* Milking Trial Prize (£2) to A. W. Bailey Hawkins for “Merton Dairymaid 5th” (9098).
- Class 11—GUERNSEY HEIFERS, not exceeding three years of age.—Entered in or eligible for the Herd Book.—*First* Inspection Prize (£5) to J. F. Remnant for “Donnington Brunette 2nd” (9952).
- Class 12—RED POLL COWS.—Entered in or eligible for the Herd Book.—*First* Inspection Prize (£7), *First* Milking Trial Prize (£7) and the Red Poll Cattle Society’s Prize (£5) to Kenneth M. Clark, Sudbourne Hall, Orford, Suffolk, for “Sudbourne Queen” (22856). *Second* Inspection Prize (£4) to Kenneth M. Clark for “Sudbourne Comfort” (22355).
- Class 13—RED POLL HEIFERS, not exceeding three years of age.—Entered in or eligible for the Herd Book.—*First* Inspection Prize (£5), *Second* Milking Trial Prize (£3), and Red Poll Cattle Society’s Prize (£5) to Kenneth M. Clark for “Sudbourne Adela” (24355). *Second* Inspection Prize (£3) to A. Carlyle Smith, Sutton Hall, Woodbridge, for “Ashmoor Sulky” (23870). *Third* Inspection Prize (£2) to A. Carlyle Smith for “Ashmoor Flatt” (23855). *First* Milking Trial Prize (£5) to Leake & Longe, Harefield Park, Harefield, for “Brightwell Clinker.” *Third* Milking Trial Prize (£2) to Kenneth M. Clark for “Sudbourne Best Choice” (23791).
- Class 14—AYRSHIRE COWS.—Cancelled.
- Class 15—SOUTH DEVON COWS.—Entered in or eligible for the Herd Book.—*First* Inspection Prize (£7) to W. & H. Whitley, Primley Farm, Paignton, Devon, for “Mayflower 28th” (5922). *Second* Inspection Prize (£4) to W. & H. Whitley for “Helwill Hilda” (12507).
- Class 16—KERRY COWS.—Cancelled.
- Class 17—DEXTER COWS.—Entered in or eligible for the Herd Book.—*First* Inspection Prize (£5) to Alfred C. King, Braishfield Manor, Romsey, Hants for “La Mancha Madeline” (1547).
- Class 18—BRITISH HOLSTEIN COW.—Entered in or eligible for the Herd Book.—*First* Inspection Prize (£7) and *First* Milking Trial Prize (£7) to A. & J. Brown, Hedges Farm, St. Albans, for “Hedges Flower” (1782). *Second* Inspection Prize (£4) to A. & J. Brown for “Park Buttercup” (3086). *Third* Inspection Prize (£2) to Mrs. Townshend, Gorstage Hall, Sandiway, Cheshire, for “Gorstage Guelder” (1528). *Second* Milking Trial Prize (£4) to W. & R. Wallace, Swangleys, Knebworth Station, Herts, for “Toddington Princess” (4518).
- Class 19.—PAIR OF COWS OF ANY BREED OR CROSS (in milk).—*First* Prize (£20) to George B. Nelson & Sons, for “Daisy” and “Buttercup” (Shorthorns). *Second* Prize (£15) to John Littleton, Arkleby Hall, Aspatria, Carlisle, for “Kate” (Cross-bred) and “Polly” (Shorthorn). *Third* Prize (£10) to W. R. Withers, Lower Court, Long Ashton, Bristol, for “Fanny” and “Gentle” (Shorthorns). *Fourth* Prize (£5) to Lord Lucas, Wrest Park, Ampthill, for

"Charity 23rd" and "White Heather" (Shorthorns). *Fifth Prize* (£3) to Joseph A. Chapman for "Laneside Daisy" and "Laneside Lily" (Shorthorns).

Class 20.—SINGLE COW OF ANY BREED OR CROSS (in milk).—*First Prize* (£10) to George B. Nelson & Sons for "Helen" (Shorthorn). *Second Prize* (£7) to Sam S. Raingill for "Ella" (Shorthorn). *Third Prize* (£5) to James Sheppy, Redlynch Park, Chewton, Keynsham, Bristol, for "Fillpail" (Shorthorn). *Fourth Prize* (£3) to Joseph A. Chapman & Son for "Laneside Rose" (Shorthorn). *Fifth Prize* (£2) to Thomas Morley, Gallants Farm, Whetstone, for "Stella" (Shorthorn).

BUTTER TESTS.

SHORTHORNS entered in Classes 1, 2, 3, 4, 5, and 6.—*First Prize* (£5 and Silver Medal) and Nelson Cup to Sam S. Raingill for "Lizzie." *Second Prize* (£4 and Bronze Medal) to Sam S. Raingill for "Liberty." *Third Prize* (£3) to J. Moffat for "Fillpail." Mr. Samuel Sanday's *Extra Prize* of £5 for the Best Cow in Class 1 gaining highest points in the Shorthorn Butter Tests to Robert L. Mond for "Fair Rosamond."

JERSEYS entered in Classes 7, 8, and 9, and eligible for the English Jersey Herd Book.—*First Prize* (Gold Medal or £10) to J. H. Smith-Barry for "Marionette." *Second Prize* (Silver Medal) to J. H. Smith-Barry for "Mammot." *Third Prize* (Bronze Medal) to W. M. Jackson for "Pretty Viêtress." *Certificates of Merit* to A. Miller-Hallett for "My Pallas," to Mrs. A. G. Bradish-Elames for "Marcella," and to J. H. Smith-Barry for "Cayenne."

ANY OTHER BREED entered in Classes 10 to 18 inclusive.—*Prize* of £3 to H. Fitzwalter Plumpton for "Rosey 11th" (Guernsey). *Prize* of £1 to J. F. Remnant for "Treacle 3rd" (Guernsey).

BULLS.

Class 21.—SHORTHORN BULLS above one year and not exceeding three years old.—Entered in or eligible for the Herd Book.—*First Prize* (£10) to E. S. Godsell, Salmon's House, Stroud, Glos, for "Salmon's Premier." *Second Prize* (£5) to Samuel Sanday, Puddington Hall, near Chester, for "Jester." *Third Prize* (£3) to Robert L. Mond for "Discoverer."

Class 22.—JERSEY BULLS, above one year and not exceeding three years old.—Entered in or eligible for the Herd Book.—*First Prize* (£10) to Dr. H. Corner for "Commodore."

Class 23.—BULLS OF ANY OTHER PURE BREED, above one year and not exceeding three years old.—Entered in or eligible for the Herd Book.—*Silver Medal* to Kenneth M. Clark for "Sudbourne Crockford" (10798) (Red Poll).

BREEDERS' PRIZES.

SILVER MEDAL TO EACH FIRST PRIZE COW, HEIFER, OR BULL IN THE SHOW.—To T. Watson for Shorthorn Cow "Marian 4th"; J. Lowes for Shorthorn Cow "Rosamond Queen"; Frank H. Thornton for Shorthorn Heifer "Kingsthorpe Barrington"; J. Moffat for Shorthorn Heifer "Natland Daisy"; T. Hargreaves for Shorthorn Heifer "Sally"; John Evens for Lincolnshire Red Shorthorn Cow "Burton Ruby Spot 11th"; John Evens for Lincolnshire Red Shorthorn Heifer "Burton Ruby 18th"; C. Fossey for Jersey Cow "My Pallas"; J. H. Smith-Barry for Jersey Cow "Marionette"; H. Falla for Jersey Heifer "Cowslip 61st"; J. H. Borrer for Guernsey Cow "Treacle 3rd"; R. E. Chilcott for Guernsey Cow "Stagenhoe Rose of Gold"; A. C. Harris for Guernsey Heifer "Donnington Brunette 2nd"; Kenneth M. Clark for Red Poll Cow "Sudbourne Queen"; Kenneth M. Clark for Red Poll Heifer "Sudbourne Adela"; E. G. Pretymen for Red Poll Heifer "Brightwell Clinker"; F. Furneaux for South Devon Cow "Mayflower 28th"; A. & J. Brown for British Holstein Cow "Hedges Flower"; E. S. Godsell for Shorthorn Bull "Premier"; Mrs. Evelyn for Jersey Bull "Commodore."

SHE-GOATS.

- Class 24—MILKING COMPETITION FOR GOATS (any Variety).—*First Prize* (Silver Medal and £2 10s.) and the Baroness Burdett-Coutts Challenge Cup to Mrs. C. J. Billson, The Priory, Martyn Worthy, Winchester, for "Oadby Daphne." *Second Prize* (£1 10s.) to Miss A. Amici-Grossi, Tremedda, St. Ives, for "Tremedda Erda." *Third Prize* (£1) to Mesdames Hunter & Soames, Long Buckley Wharf, Rugby, for "Pytchley Belle." *Fourth Prize* (10s.) to Mrs. J. C. Straker, The Leazes, Hexham, for "Leazes Lismore."
- Class 25—SHE-GOATS OF ANY VARIETY that have won two or more *First Prizes* in Classes other than for Kids or Goatlings, on or before September 3rd, 1915.—*First Prize* (£2) and British Goat Society's Challenge Cup to Mrs. J. C. Straker for "Leazes Lady Fortune." *Second Prize* (£1) to Mesdames Hunter & Soames for "Pytchley Belle."
- Class 26—SHE-GOATS, SWISS OR ANGLO-SWISS, being any She-Goat bred from English and any recognised breed or breeds of Swiss Goats without any admixture of Anglo-Nubian or other blood for at least six generations on both sides (over two years), not eligible for Class 25.—*First Prize* (£2) to Herbert E. Hughes, Goats, Broxbourne, for "Broxbourne March Maiden." *Second Prize* (£1) to Mrs. C. J. Billson for "Oadby Daphne." *Third Prize* (10s.) to Miss A. Amici-Grossi for "Tremedda Erda."
- Class 27—SHE-GOATS, ANGLO-NUBIAN, being any Goat entered in the Anglo-Nubian Section of the Herd Book, or eligible for entry therein (over two years), not eligible for Class 25.—*First Prize* (£2) to Lady Gertrude Crawford, Coxhill, Lymington, for "Piffle." *Second Prize* (£1) to Hon. Mrs. Pomeroy, Greens Norton Court, Towcester, for "Forest Nonentity." *Third Prize* (10s.) to Mrs. Reginald Pease, Sadberge Hall, Middleton St. George, for "Sadberge Partridge."
- Class 28—SHE-GOATS, ANY OTHER VARIETY.—Not eligible for previous classes. Over two years on October 1st, 1915. Two *Equal First Prizes* (£2 each) to Herbert E. Hughes for "Broxbourne Fairy Queen," and to Mrs. Lacy-Hulbert, Mayfield, Cheam, Surrey, for "Withdean Molly." *Third Prize* (10s.) to Mrs. J. C. Straker for "Leazes Lismore."
- Class 29—GOATLINGS, SWISS OR ANGLO-SWISS, being any Goatling bred from English and any recognised breed or breeds of Swiss Goats without any admixture of Anglo-Nubian or other blood for at least six generations on both sides (over one but not over two years).—*First Prize* (£2) and Bronze Medal to Mrs. J. C. Straker for "Leazes Haddon."
- Class 30—GOATLINGS, ANGLO-NUBIAN, being any Goatling entered in the Anglo-Nubian Section of the Herd Book, or eligible for entry therein (over one but not over two years).—*First Prize* (£2) to W. S. Horne, Nash Court, Westwell, Ashford, Kent, for "Nash Eva." *Second Prize* (£1) to Mrs. Reginald Pease for "Sadberge Chaffinch." *Third Prize* (10s.) to Sir Humphrey F. de Trafford, Bart., Hill Crest, Market Harborough, for "Harboro' Barmaid."
- Class 31—GOATLINGS, ANY OTHER VARIETY (over one but not over two years), not qualified for Classes 29 or 30.—*First Prize* (£2) to Miss Pope, Bashley Lodge, New Milton, Hants, for "Pride." *Second Prize* (£1) to Miss Pope for "Prejudice." *Third Prize* (10s.) to Mrs. Sydney Wilson, Priestfield, Burnapfield, Co. Durham, for "Sedgemere Dimple."
- Class 32—FEMALE KIDS, SWISS OR ANGLO-SWISS, being any kid bred from English and any recognised breed or breeds of Swiss Goats without any admixture of Anglo-Nubian or other blood for at least six generations on both sides (not over one year).—*First Prize* (£2) to Herbert E. Hughes for "Broxbourne Curls." *Second Prize* (£1) to Mrs. C. J. Billson for "Oadby Empress."
- Class 33—FEMALE KIDS, ANGLO-NUBIAN, being any Kid entered in the Anglo-Nubian Section of the Herd Book, or eligible for entry therein (not over one year).—*First Prize* (£2) to Hon. Mrs. Pomeroy for "Towcester Tansey."

Second Prize (£1) to Gertrude Lady Decies, The Mount, Farnham, Slough, for "Peggy." *Third Prize* (10s.) to Reginald Pease, Sadberge Hall, Middleton St. George, for "Sledwich Matilda."

Class 34—FEMALE KIDS, ANY OTHER VARIETY (not over one year), not qualified for Classes 32 or 33.—*First Prize* (£2) to Miss Pope for "Prude." *Second Prize* (£1) to Miss A. B. Cullen, Rose Cottage, Fay Gate, Horsham, for "Keighley Biddie." *Third Prize* (10s.) to Miss Maud G. Cullen, Elm Croft, Horley, Surrey, for "Keighley Fawnie." *Fourth Prize* (5s.) to Mrs. Lacy-Hulbert for "Mayfield April."

CHEESE.

(For Makers only, residing in any part of the United Kingdom.)

Class 35—STILTON (6 Cheeses).—*First Prize* (£7) to Henry Morris, Saxelbye Dairy Farm, Melton Mowbray. *Second Prize* (£4) to Tuxford & Nephews, Sharpe End Dairy, Melton Mowbray. *Third Prize* (£2) to Belvoir Vale Dairies, Harby, Melton Mowbray.

Class 36—STILTON (36 Cheeses).—*First Prize* (Silver Medal and £7) to Tuxford and Nephews. *Second Prize* (£4) to Belvoir Vale Dairies.

Class 37—CHEDDAR TRUCKLES (6 Cheeses).—*First Prize* (£5) to E. E. Hoddinott, Manor Court Farm, Trowle, Trowbridge. *Second Prize* (£3) to Ernest Brake, Mudford Sock, Yeovil. *Third Prize* (£2) to P. H. Clarke, West Barn Farm, Witham Friary, Bath.

Class 38—CHEDDAR (4 Cheeses).—*First Prize* (£7) to E. E. Hoddinott. *Second Prize* (£4) to W. C. Spencer, The Home Farm, Hillfield, Cerne Abbas, Dorset. *Third Prize* (£3) to F. G. Butcher, Barley Hill Farm, Poulshot, Devizes. *Fourth Prize* (£2) to B. Chinn, Hilton, Blandford. *Fifth Prize* (£1) to W. H. E. Greenhill, Hilperton Marsh Farm, Trowbridge.

Class 39—CHEDDAR (20 Cheeses).—*First Prize* (Silver Medal and £10) to E. E. Hoddinott. *Second Prize* (£7) to P. H. Clarke. *Third Prize* (£5) to W. C. Spencer. *Fourth Prize* (£3) to William Plunkett, junr., Myremill Dairy, Maybole, Ayrshire. *Fifth Prize* (£2) to James C. Barber, Carleton, Kirkcudbright.

Class 40—CHESHIRE (20 Cheeses).—*First Prize* (Silver Cup presented by George Barbour, Esq., J.P., and £10) to T. E. Jones, Moss Farm, Haughton, Tarporley. *Second Prize* (£5) to Charles E. Parton, Haughton Hall Farm, Tarporley. *Third Prize* (£3) to W. H. Hobson, Gonsley, Blakenhall, Nantwich. *Fourth Prize* (£2) to Miss Alice Boffey, Wardle Bridge, Nantwich.

Class 41—CHESHIRE (4 Coloured Cheeses, not less than 40 lbs. each).—*First Prize* (£7) to J. Bibby & Sons, Ltd., Hall-o'-Coole, Nantwich. *Second Prize* (£4) to James Bennion, Gorse Croft, Audlem, Cheshire. *Third Prize* (£2) to Charles E. Parton.

Class 42—CHESHIRE (4 Uncoloured Cheeses, not less than 40 lbs. each).—*First Prize* (£7) to Charles E. Parton. *Second Prize* (£4) to W. R. Lea, Manor Farm, Hatherton, Nantwich. *Third Prize* (£2) to Thomas Lew, Top House Farm, Coole Pilate, Nantwich.

Class 43—LEICESTER (4 Cheeses).—*First Prize* (£4) to S. Colton, The Dairy, Barkstone-le-Vale, Nottingham. *Second Prize* (£3) to F. W. Tomlinson, The Home Farm, Ashby Parva, Lutterworth. *Third Prize* (£2) to F. W. Gilbert, Ltd., St. James' Chambers, Derby.

Class 44—LANCASHIRE (4 Cheeses).—*First Prize* (£4) to William Pearson, New Hall, Pilling, Garstang. *Second Prize* (£3) to John Bee, Bulsnape Hall, Goosnargh, Preston. *Third Prize* (£2) to John Wilson, Brookfield, Cottam, Preston.

Class 45—DERBY (4 Uncoloured Cheeses, not less than 25 lbs. each).—*First Prize* (£4) to John M. Nuttall, Hartington, Buxton. *Second Prize* (£3) to George Woodfield, The Dairy, Gnosall, Staffs. *Third Prize* (£2) to T. Bould, Cheese Factory, Ellastone, Ashbourne.

Class 46—DOUBLE GLOSTER (4 Cheeses, from 26 lbs. to 30 lbs. each, total weight not to exceed 120 lbs.).—*First Prize* (£4) to George Woodfield. *Second Prize* (£3) to Mrs. C. A. Goodwin, Carr House, Stone, Staffs. *Third Prize* (£2) to E. F. Hoddinott.

Class 47—SINGLE GLOSTER (4 Cheeses, from 13 lbs. to 15 lbs. each, total weight not to exceed 60 lbs.).—*First Prize* (£4) to Mrs. L. H. Shield, Alkington Farm, Berkeley, Glos.

Class 48—CAERPHILLY (4 Cheeses, not exceeding 8 lbs. each).—*First Prize* (£4) to Miss Rachael James, Llancayo, Usk, Mon. *Second Prize* (£3) to Wilts United Dairies, Ltd., Wells, Somerset. *Third Prize* (£2) to F. House, Withy Grove, Huntspill, Bridgwater.

Class 49—WENSLEYDALE (Blue Moulded, 6 Cheeses).—*First Prize* (£4) to Alfred Rowntree, The Dairy, Coverham, Middleham.

Class 50—CREAM CHEESE (made from pure cream only; no milk or curd to be added; 6 Cheeses).—*First Prize* (£1) to East Anglian Institute of Agriculture, Chelmsford. *Second Prize* (10s.) to C. & G. Pricdeaux, The Creamery, Stalbridge, Dorset.

Class 51—UNRIPENED SOFT CHEESE (other than Cream Cheese, made direct from milk; 4 Cheeses).—*First Prize* (£1) to Miss J. Watt White, Fyfield Hall, Ongar. *Second Prize* (10s.) to H. G. Howard, 37, Leigh Road, Westcliff-on-Sea.

COLONIAL CHEESE.

(Open to Makers only.)

Class 52—CHEDDAR (Coloured or Uncoloured; 4 Cheeses, not less than 60 lbs. each).—No entry.

BACON AND HAMS.

(Open to Curers only, residing in any part of the United Kingdom.)

(Except Class 61, open to Ireland only.)

Class 53—PALE DRIED BACON (4 hamless sides of spring or winter cure).—Cancelled.

Class 54—SMOKED BACON (4 sides, mild cured in Wiltshire style, with ham attached).—*First Prize* (Silver Medal) to Herts and Beds Bacon Factory, Ltd., Hitchin. *Second Prize* (Bronze Medal) to Hilliers Bacon Curing Co., Ltd., Newmarket, near Stroud.

Class 55—PALE DRIED BACON (4 sides, mild cured in Wiltshire style, with ham attached).—*First Prize* (Silver Medal) to Herts and Beds Bacon Factory, Ltd. *Second Prize* (Bronze Medal) to J. H. Ismay, Iwerne Minster, Blandford.

Class 56—TWO SIDES OF BACON SMOKED, TWO SIDES OF BACON PALE DRIED, TWO HAMS SMOKED, AND TWO HAMS PALE DRIED (the weight of the sides not less than 56 lbs., and not more than 68 lbs. each; the hams not less than 12 lbs. and not more than 20 lbs. each).—*First Prize* (£10 10s.) to Colin & Co., Ltd., Burton Street, Melton Mowbray. *Second Prize* (£5 5s.) to Herts and Beds Bacon Factory, Ltd.

Class 57—PALE DRIED HAMS (4 hams, long cut, of winter or spring cure, not over 14 lbs. weight).—*First Prize* (Silver Medal) to Marsh & Baxter, Ltd., Brierley Hill, Staffs. *Second Prize* (Bronze Medal) to Palethorpes, Ltd., Dudley Port, Staffs.

Class 58—PALE DRIED HAMS (4 hams, long cut, of winter or spring cure, over 14 lbs. weight).—*First Prize* (Silver Medal) to Palethorpes, Ltd. *Second Prize* (Bronze Medal) to Marsh & Baxter, Ltd.

Class 59—SMOKED HAMS (4 hams, long cut, mild cured, not over 10 weeks cured, not over 15 lbs. weight).—*First Prize* (Silver Medal) to Marsh & Baxter, Ltd. *Second Prize* (Bronze Medal) to E. & H. Clarke, Ltd., Cuddington Mill, Northwich.

- Class 60—PALE DRIED HAMS (4 hams, long cut, mild cured, not over 10 weeks cured, over 15 lbs. weight).—*First Prize* (Silver Medal) to Palchthorpes, Ltd. *Second Prize* (Bronze Medal) to Marsh & Baxter, Ltd.
- Class 61—SMOKED HAMS (4 hams, cured in Ireland, under 14 lbs. weight).—(No Entry.)
- Class 62—TWO HAMS (cured in the farmhouse or home; professional bacon curers not eligible).—*First Prize* (£2) to Thomas Welsby, Rhyd Alyn, Mold, North Wales. *Second Prize* (£1) to Thomas Welsby.
- Class 63—SELLING CLASS FOR HAMS (any variety) (2 hams).—*First Prize* (£2) to T. Marshall & Son, Dore, near Sheffield. *Second Prize* (£1) to Palethorpes, Ltd. *Third Prize* (10s.) to Evans & Co. (Melton Mowbray), Ltd., Melton Mowbray.

BUTTER.

(Open to Makers only, residing in any part of the United Kingdom.)

- Class 64—BUTTER, slightly Salted. (Open only to farmers, their wives, sons, and daughters, occupying not exceeding 100 acres, and who have never won a Prize in the Butter Classes at any of the Society's Shows). 2 lbs. in 1-lb. lumps.—*First Prize* (£3) to Miss Bessie Hern, Oakley, Horrabridge, Devon. *Second Prize* (£2) to Miss Olive F. Way, Bridge, Bishop's Nympton, South Molton, Devon. *Third Prize* (£1) to Miss Lucy Yeld, Dorstone House, Dilwyn, Leominster.
- Class 65—BUTTER (Champion Class).—(Open to First Prize Winners of the previous two years only. Competitors in this class not eligible to compete in any other Butter Class at this Dairy Show). 2 lbs. in 1-lb. lumps.—*First Prize* (Gold Medal) to Henry P. Sturgis, Givons, Leatherhead. *Second Prize* (Silver Medal) to G. C. Ellis, Worston, Yealton, Plymouth.
- Winners of the Gold Medal in the above class will not be eligible to compete in the Butter Classes at the Dairy Show again.
- Class 66—BUTTER, perfectly free from Salt, the produce of Channel Islands Cattle and their Crosses. 2 lbs. in 1-lb. lumps.—Two *Equal First Prizes* (£3 each) to Miss Bessie Hern; and to Mrs. Grove, Carherthen, Probus, Cornwall. Two *Equal Second Prizes* (£2 each) to Miss Frances Irving, Toppin Castle, Heads Nook, Carlisle; and to Miss Beatrice Northcott, Holmbush, St. Austell. Two *Equal Third Prizes* (£1 each) to Mrs. Priestley, Little Missenden Abbey, Great Missenden, Bucks; and to Mrs. B. Miles, Elm Farm, Holwell, Sherborne, Dorset.
- Class 67—BUTTER, slightly Salted, the produce of Channel Islands Cattle and their Crosses. 2 lbs. in 1-lb. lumps.—Two *Equal First Prizes* (£3 each) to Lady Yule, Hanstead House, Bricket Wood, Herts, and to Miss Olive F. Way. Two *Equal Second Prizes* (£2 each) to Miss Bessie Hern, and to Mrs. B. Miles. Two *Equal Third Prizes* (£1 each) to H. Yates Thompson, Oving House, Aylesbury, and to Mrs. A. A. Bere, Stoodleigh Barton, Tiverton, Devon.
- Class 68—BUTTER, perfectly free from Salt, the produce of Shorthorn and other Cattle and their Crosses (except Channel Islands and their Crosses). 2 lbs in 1-lb. lumps.—Two *Equal First Prizes* (£3 each) to Miss Frances Irving, and to Mrs. P. J. Moore, Lower Bulworthy, Raekenford, Morehard Bishop Devon. Two *Equal Second Prizes* (£2 each) to Miss Bessie Hern, and to E. Horsman Bailey, Foxholmes, Chipping Norton. Two *Equal Third Prizes* (£1 each) to Miss S. Page, Whitsley, St. Giles, Torrington, Devon, and to Mrs. E. C. M. Baulkwill, Dipper Farm, Shebbear, Devon.
- Class 69—BUTTER, slightly Salted, the produce of Shorthorn and other Cattle and their Crosses (except Channel Islands and their Crosses). 2 lbs. in 1-lb. lumps.—Two *Equal First Prizes* (£3 each) to Miss Bessie Hearn, and to Mrs. B. Miles. Two *Equal Second Prizes* (£2 each) to Miss Frances Irving, and to Mrs. A. A. Bere. Two *Equal Third Prizes* (£1 each) to Miss S. Page, and to John R. T. Kingwell, Great Aish, South Brent, Devon.

- Class 70—BUTTER, slightly Salted. 2 lbs. in 1-lb. lumps.—Two *Equal First Prizes* (£3 each) to Miss Bessie Hern, and to Mrs. A. A. Bere. Two *Equal Second Prizes* (£2 each) to Miss Frances Irving, and to Miss Olive F. Way. Two *Equal Third Prizes* (£1 each) to Miss Daisy Underwood, Little Gaddesden, Berkhamstead, and to Miss Beatrice Northcott.
- Class 71—BUTTER, free from Salt or slightly Salted at the discretion of the Exhibitor, to be made from Scalded Cream only. 2 lbs. in 1-lb. lumps.—*First Prize* (£3) to Miss Olive F. Way. *Second Prize* (£2) to Miss Frances Irving. *Third Prize* (£1) to Mrs. A. A. Bere.
- Class 72—BUTTER, free from Salt, 2 lbs. in oblong pounds or bricks, shaped with Scotch hands, but without decoration or printing on top of pounds.—*First Prize* (£3) to Mrs. B. Miles. *Second Prize* (£2) to Miss Olive F. Way. *Third Prize* (£1) to Miss Frances Irving.
- Class 73—BUTTER, made up in the most marketable design, to be packed and sent by parcels post and opened in the presence of the judge. Quality and packing to be considered in making the awards. 1 lb.—*First Prize* (£2) to Mrs. A. A. Bere. *Second Prize* (£1) to Mrs. Grove. *Third Prize* (10s.) to Miss V. M. Arthurs, Hatchers Farm, Great Kingshill, High Wycombe.
- Class 74—BUTTER, free from Salt, in 24-lb. boxes of 12 rolls. Packages (non-returnable) to be taken into consideration. The Rolls not to be separately wrapped.—*First Prize* (£3) to Granagh Co-operative Dairy Society, Ballingarry, Co. Limerick. *Second Prize* (£2) to Ardagh Co-operative Dairy, Ardagh, Co. Limerick. *Third Prize* (£1) to C. & G. Prideaux, Ltd., Motcombe, Dorset. *Fourth Prize* (10s.) to Ballymote Co-operative Agricultural and Dairy Society Ltd., Ballymote, Co. Sligo.
- Class 75—MILD CURED BUTTER, in boxes of 24 rolls of 1 lb. each, slightly Salted. Packages (non-returnable) to be taken into consideration. Wrapping allowed.—*First Prize* (£3) to Granagh Co-operative Dairy Society. *Second Prize* (£2) to Ballymote Co-operative Agricultural and Dairy Society, Ltd. *Third Prize* (£1) to C. & G. Prideaux, Ltd., *Fourth Prize* (10s.) to Springfield Dairy Society, Enniskillen, Co. Fermanagh.
- Class 76—CURED BUTTER, not less than 28 lbs., slightly Salted. Packages (non-returnable) to be taken into consideration.—*First Prize* (£3) to Ballymote Co-operative Agricultural and Dairy Society, Ltd. *Second Prize* (£2) to Granagh Co-operative Dairy Society. *Third Prize* (£1) to C. & G. Prideaux Ltd. *Fourth Prize* (10s.) to Oola Co-operative Creamery, Ltd., Oola, Tipperary.
- Class 77—CURED BUTTER, 56 lbs. Packages (non-returnable) to be taken into consideration.—*First Prize* (£3) to Granagh Co-operative Dairy Society. *Second Prize* (£2) to C. & G. Prideaux, Ltd. *Third Prize* (£1) to Ballymote Co-operative Agricultural and Dairy Society, Ltd. *Fourth Prize* (10s.) to J. M. Slattery, Tralee, Co. Kerry.
- Class 78—FANCY OR ORNAMENTAL DESIGN IN BUTTER, with foliage or other extraneous decoration.—*First Prize* (£3) to Miss H. M. Trenchard, Uphay Farm, Axminster, Devon. *Second Prize* (£2) to Miss Edith Bush, The Rookery, Great Ellingham, Attleborough.
- Class 79—FANCY OR ORNAMENTAL DESIGN IN BUTTER, without extraneous decoration, adapted for table use.—*First Prize* (£3) to Miss H. M. Trenchard. *Second Prize* (£2) to Miss Edith Bush.

SPECIAL PRIZE GIVEN BY MESSRS. ELKINGTON & Co., LTD.

Awarded for the best Exhibit in Classes 64, 66 to 73.—“Elkington” Cup (value £7) to Miss Bessie Hern, Oakley, Horrabridge, Devon (Class 70, No. 780).

COLONIAL BUTTER.

(OPEN TO MAKERS ONLY.)

Class 80—SALTED BUTTER, one box containing not less than 56 lbs.—*First Prize* (Gold Medal) to Pambula Co-operative Creamery and Dairy Co., Ltd., Pambula, New South Wales, Australia. *Second Prize* (Silver Medal) to Swanpool & Moorngag Co-operative Butter Factory, Victoria, Australia. *Third Prize* (Bronze Medal) to Queensland Farmers' Co-operative Co., Ltd., Boonah, Queensland, Australia.

Class 81—UNSALTED BUTTER, one box containing not less than 56 lbs.—*First Prize* (Gold Medal) to Kiewa Butter and Cheese Factory Co., Ltd., Victoria, Australia. *Second Prize* (Silver Medal) to Dungog Co-operative Butter Factory, Ltd., Dungog, Australia. *Third Prize* (Bronze Medal) to Gormandale Butter Factory, Victoria, Australia.

CREAM.

Class 82—CLOTTED CREAM, in vessels (filled) ready for sale.—*First Prize* (Silver Medal) to Mrs. W. R. Beer, Pill Farm Dairy, Barnstaple. *Second Prize* (Bronze Medal) to Miss Beatrice Northcott, Holmbush, St. Austell.

Class 83—CREAM, OTHER THAN CLOTTED, in vessels (filled) ready for sale.—*First Prize* (Silver Medal) to Mid-Sussex Dairy Co., Ltd., Sheffield Park Station, Lewes. *Second Prize* (Bronze Medal) to C. & G. Prideaux, Ltd., The Creamery, Stalbridge, Dorset.

SKIM-MILK BREAD AND SCONES.

(Mixed with Skim Milk in lieu of Water.)

Class 84—WHITE BREAD, 2 loaves, not exceeding 2 lbs. each.—*First Prize* (Silver Medal) to W. Jackson & Son, Ltd., Victoria Street, Hull. *Second Prize* (Bronze Medal) to L. W. Jenkins, 333 Fulham Palace Road, London, S.W.

Class 85—BROWN BREAD, 2 loaves, not exceeding 2 lbs. each.—*First Prize* (Silver Medal) to W. Jackson & Son, Ltd. *Second Prize* (Bronze Medal) to F. J. Paine, 375, Lordship Lane, East Dulwich.

Class 86—FANCY BREAD, not exceeding 4 lbs.—*First Prize* (Silver Medal) to W. Jackson & Son, Ltd., *Second Prize* (Bronze Medal) to W. Baldwin & Son, Magnet Bakery, Thorofare, Woodbridge.

Class 87—HOME-MADE BREAD, 2 loaves, not exceeding 2 lbs. each. (Bakers or members of their families are not eligible to compete in this Class.)—*First Prize* (Silver Medal) to Mrs. H. Pendlebury, Brook Fold Farm, Harwood, Bolton. *Second Prize* (Bronze Medal) to Mrs. S. A. Keirby, Hilly Laid Road, Thornton-le-Fylde.

Class 88—TWELVE SCONES (baked on Girdle or Plate or in Oven, any shape, not exceeding 6 ozs. each, without fruit).—*First Prize* (Silver Medal) to L. W. Jenkins. *Second Prize* (Bronze Medal) to L. W. Jenkins.

HONEY, WAX, &c.

Class 89—TWELVE JARS OF LIGHT-COLOURED EXTRACTED HONEY, 1 lb. each approximate weight.—*First Prize* (£1) to James Pearman, Penny Long Lane, Derby. *Second Prize* (15s.) to F. W. Blake, Rose Cottage, Watts Lane, Rochford. *Third Prize* (12s. 6d.) to Joseph S. Hicks, High Fordon, Hunmanby. *Fourth Prize* (10s.) to John Rees, Tyllwyd Farm, Lisvane, Cardiff.

Class 90—TWELVE JARS OF MEDIUM-COLOURED EXTRACTED HONEY (other than Heather Honey), 1 lb. each approximate weight.—*First Prize* (£1) to George Bryden, Hamilton House, Star Hill, Rochester. *Second Prize* (15s.) to James Lee & Son, Ltd., George Street, Uxbridge. *Third Prize* (12s. 6d.) to James Pearman. *Fourth Prize* (10s.) to W. B. Allister, Throckenholt, Wisbech.

Class 91—TWELVE JARS OF DARK-COLOURED EXTRACTED HONEY (including any variety of Heather Mixture), 1 lb. each approximate weight.—Cancelled.

- Class 92—TWELVE JARS OF RUN (*Ling, Caluna vulgaris*) HEATHER HONEY, 1 lb. each approximate weight.—*First Prize* (15s.) to J. Pearman. *Second Prize* (10s.) to M. J. Lamboll, Chiddingfold, Surrey.
- Class 93—TWELVE JARS OF GRANULATED HONEY OF 1914, or any previous year, 1 lb. each approximate weight.—*First Prize* (£1) to W. Garwell, 71, Thirlwell Road, Heeley, Sheffield. *Second Prize* (10s.) to James Pearman,
- Class 94—TWELVE SECTIONS OF HONEY, other than Heather (size $4\frac{1}{4}$ by $4\frac{1}{4}$) 1 lb. each approximate weight.—*First Prize* (£1) to James Lee & Son, Ltd.
- Class 95—SIX SECTIONS OF HEATHER HONEY, 1 lb. each approximate weight.—*First Prize* (£1) to Robert Robson, Cheviot Street Wooler. *Second Prize* (15s.) to Lady Gertrude Crawford, Coxhill Lymington.
- Class 96—DISPLAY OF COMB AND EXTRACTED HONEY OF ANY YEAR, approximately 100 lbs. in weight, shown on a space of 3 ft. by 3 ft.—*First Prize* (£2) to James Lee & Son, Ltd.
- Class 97—WAX (not less than 2 lbs., in 2 cakes only, the produce of the Exhibitor's Apiary; extracted and cleaned by the Exhibitor or his assistants).—*First Prize* (15s.) to J. T. Willson, York Villas, Shirebrook, Mansfield. *Second Prize* (10s.) to James Pearman. *Third Prize* (7s. 6d.) to Fred Harris, High Ferry, Sibsey, Boston, Lincs.
- Class 98—WAX (not less than 3 lbs., the produce of the Exhibitor's Apiary, extracted and cleaned by the Exhibitor or his assistants. To be shown in shape, quality, and package suitable for the retail trade).—Cancelled.
- Class 99—INTERESTING AND INSTRUCTIVE EXHIBIT OF A PRACTICAL OR SCIENTIFIC NATURE, connected with Bee Culture, not mentioned in the foregoing Classes.—No Entry.

COLONIAL HONEY.

(Produced in the Over-seas Dominions by *bona-fide* individual growers only—not merchants or Associations.)

- Class 100—TWELVE JARS OF EXTRACTED HONEY, 1 lb. each approximate weight.—No Entry.

ROOTS, &c.

Information must be given on the Entry Form as to the soil in which the Roots &c., are grown; also the name of seed and manurial treatment. All Mangolds and Swedes must bear at least 3 inches of leaf, and be washed but not trimmed, oiled, or otherwise treated.

- Class 101—SIX SPECIMENS OF LONG MANGOLDS, drawn from a crop of not less than 2 acres.—*First Prize* (£3) to James James, Sheepcourt, Bonvillstone, Cardiff. *Second Prize* (£2) to William Watts, Ty-draw, Llantrithyd, Cowbridge.
- Class 102—SIX SPECIMENS OF GLOBE MANGOLDS, drawn from a crop of not less than 2 acres.—*First Prize* (£3) to R. Thomas, Homri, St. Nicholas, Cardiff. *Second Prize* (£2) to William Watts.
- Class 103—SIX SPECIMENS OF GOLDEN OR CRIMSON TANKARD MANGOLDS, drawn from a crop of not less than 2 acres.—*First Prize* (£3) to William Watts. *Second Prize* (£2) to James James.
- Class 104—SIX SPECIMENS OF INTERMEDIATE WHITE-FLESHED MANGOLDS drawn from a crop of not less than 2 acres.—*First Prize* (£3) to William Watts. *Second Prize* (£2) to James James.
- Class 105—SIX SPECIMENS OF SWEDES, PURPLE OR BRONZE TOP, drawn from a crop of not less than 2 acres.—*First Prize* (£3) to John Perry, The Grange, Ampleforth College, Malton. *Second Prize* (£2) to William Watts.
- Class 106—SIX SPECIMENS OF SWEDES, GREEN TOP, drawn from a crop of not less than 2 acres.—*First Prize* (£3) to John Perry. *Second Prize* (£2) to R. Thomas.

Class 107—SIX SPECIMENS OF TURNIPS, any one variety, drawn from a crop of not less than 2 acres.—*First Prize* (£3) to John Perry. *Second Prize* (£2) to William Watts.

Class 108—COLLECTION OF ROOTS, &c., FOR CATTLE FEEDING IN WINTER. To consist of Six Specimens of not exceeding 12 varieties.—*First Prize* (£5) to John Perry. *Second Prize* (£3) to J. H. Ismay, Iwerne Minster, Blandford.

INVENTIONS, &c.

Class 109—ANY NEW INVENTION relating to the Dairy Industry, or one showing distinct and practical improvement, especially as to saving of labour, not eligible for competition in any other Class, and not previously exhibited in competition at the Dairy Show.—*Silver Medal* to A. E. Crook, 71, Queen Street, Cheapside, London, E.C., for "Rapid Lock Label"; and to Perfect Dairy Machines, Ltd., 105, Middle Abbey Street, Dublin, for "Unique Milk Pump."

BUTTERMAKING CONTESTS.

Class 110—Section A (open to those who have never won a prize at any show wherever held).—*First Prize* (£3) to Miss E. M. Smallbone, 85, Christchurch Road, Reading. *Second Prize* (£2) to Miss D. Mottershall, 156, Cambridge Street, Aylesbury. *Third Prize* (£1) to Miss M. Boundy, Bilbeare, North Tawton, Devon.

Class 110—Section B.—*First Prize* (£3) to Miss O. F. Fawcett, Drewton Manor, South Cove, Yorks. *Second Prize* (£2) to Miss A. M. Moylen, Stonybrac, Longpark, Chesham Bois, Bucks. *Third Prize* (£1) to Miss M. Addis, Chilston, Madley, Herefordshire.

Class 111—Open to Students who attended Classes at the British Dairy Institute, Reading, for not less than one month during the past two years.—*First Prize* (£3) to Miss May C. Thomas, British Dairy Institute, Reading. *Second Prize* (£2) to Miss K. M. Thornbery, 24, Colberg Place, Stamford Hill, London, N. *Third Prize* (£1) to Miss Edith Amor, 33, St. Maur Road, Fulham, London, S.W.

Class 112—Section A (open to Men and Women).—*First Prize* (£3) to Miss J. L. Prichard, Upton Warren, Bromsgrove. *Second Prize* (£2) to Miss Janet James, Blaen Baglan Dairy, Aberavon. *Third Prize* (£1) to Miss Rosa Davies, Manor Farm, Cadnam, Southampton.

Class 112—Section B.—*First Prize* (£3) to Miss E. Addis, Chilston, Madley, Herefordshire. *Second Prize* (£2) to Miss May C. Thomas. *Third Prize* (£1) to Mrs. J. T. H. Farmer, Langstone, Moretonhampstead, S. Devon.

Class 112—Section C.—*First Prize* (£3) to Miss M. Lawrence, Rull Farm, Cul lampton, Devon. *Second Prize* (£2) to Miss H. M. Trenchard, Uphay Farm, Axminster. *Third Prize* (£1) to Miss F. Parkinson, Wimbleshurst Farm, Horsham.

Class 113—Open to First Prize Dairy Show Winners of 1915.—*First Prize* (£3) to Miss J. L. Prichard. *Second Prize* (£2) to Miss E. Addis. *Third Prize* (£1) to Miss M. Lawrence.

Class 114—Champion Contest (open to Winners of First Prizes in the preceding Classes, or at the Dairy Show, 1914. Champions of any year excepted).—*First Prize* (Gold Medal and £5) to Miss M. Lawrence. *Second Prize* (£3) to Miss S. A. Stephens, 3rd Southern Hospital, Oxford. *Third Prize* (£2) to Mrs. Mary Wallace, Jenningsbury, Hertford.

MILKERS' CONTESTS.

Class 115—Open to Men over 18 years. Competitors of 1911, or prior thereto, are not eligible to compete this year.—*First Prize* (£5) to Ernest Goodwin, Carr House, Stone, Staffs. *Second Prize* (£3) to Henry C. Wookey, Kennell Farm, Long Ashton, Bristol. *Third Prize* (£2) to Stanley Foster, North Western Dairy, Mossley Hill, Liverpool.

Class 116—Open to Boys under 18 years.—*First Prize* (£5) to William Simpson, Rook Tree, Haynes, Beds. Two *Equal Second Prizes* (£2 each) to Thomas Morrison, Manor Farm, Cliffe-at-Hoo, Rochester, and to T. L. Masson, Attimore Hall, Hatfield.

Class 117—Open to Women over 18 years. Competitors of 1911, or prior thereto, are not eligible to compete this year.—*First Prize* (£5) to Miss P. H. Eardley, Bearstone, Market Drayton. *Second Prize* (£3) to Miss H. Richardson, Halam Grange, Southwell. *Third Prize* (£2) to Miss A. M. Eradley, Bearstone, Market Drayton. Two *Equal Fourth Prizes* (£1 each) to Miss Edith M. James, Llancayo, Usk, Mon, and to Miss D. A. Simpson, Dorrington, Market Drayton. *Fifth Prize* (10s.) to Miss B. A. Jones, Gilmarton, Lutterworth.

Class 118—Open to Girls under 18 years.—*First Prize* (£5) to Miss D. K. Burfitt, Goodedge Farm, North Burham, Bruton. *Second Prize* (£3) to Miss M. Shepherd, Brook Farm, Butcombe, Blagdon. *Third Prize* (£2) to Miss E. E. Jones, Haston Grove, Hadnall, Shrewsbury.

Class 119—Champion Contest (open to *First Prize Winners* in preceding Classes or at the Dairy Shows of 1913 and 1914; *Champions* of any year excepted).—*Gold Medal* and £5 to Miss Nancy Jones, The New House, Stanton-on-Wye.

SPECIAL PRIZE.—A case of Silver Tea Spoons, offered by Miss Ethel Everest to the Best Competitor in Class 117, being a Farmer's Wife or Daughter, or Volunteer Milker, providing sufficient proficiency is shown.—Awarded to Miss P. H. Eardley.

SPECIAL PRIZE.—A Writing Desk, offered by Miss Ethel Everest to the Best Competitor in Class 118, who is regularly engaged at Milking—Awarded to Miss D. K. Burfitt.

APPLICATIONS FOR PATENTS FOR DAIRY APPLIANCES, &c.

From January 1st to December 31st, 1915.(In consequence of the war Applications under this heading have
greatly diminished.)

| No. of Application. | Name of Applicant. | Subject of Invention. |
|---------------------|-------------------------------------|---|
| 2013 | Erslev, K. | Manufacture of margarine. |
| 2401 | Gaulin, A. | Milk separators. |
| 2772 | Vasey, S. A., and Cleeve, U. A. ... | Condensed milk or dry milk powder, and processes for its manufacture. |
| 3782 | Claridge, E. | Cooling - attachments for cream separators |
| 4880 | Melhuish, W. J. | Manufacture of artificial milk, and treatment of its residues. |
| 5572 | Salemius, A. G. G. | Centrifugal cream-separators. |
| 6734 | Lindsay, G. | Device for making pats of butter. |
| 7105 | Cohen, S. S. | Manufacture of condensed milk, and apparatus therefor. |
| 7713 | Jassawalla, K. S. | Vacuum box can, or chamber to keep fruit, vegetables, milk, and the like for a long period. |
| 7766 | Vasey, S. A., and Cleeve, U. A. ... | Manufacture of dry milk or cream powder. |
| 8371 | Jensen, U. A. | Composition of matter for food from banana and milk, and method of preparing same. |
| 9626 | Melhuish, W. J. | Substitute for milk made from coya and arachide, and the treatment of the residues. |
| 9776 | Wood, B. B. | Combined cream separator and churn. |
| 13563 | Borgen, H. | Method of and apparatus for making margarine. |
| 13903 | Melhuish, W. J. | Manufacture of artificial milk, and the treatment of its residues. |
| 14042 | Wearn, J. S. | Cream-cooler for attachment to cream-separators. |
| 15903 | Tomkys, P. | Device for use in tempering butter. |
| 17343 | Mellodey, W., and Cockcroft, W. .. | Revolving cheese-cutting machine. |

ANNUAL REPORT OF THE CONSULTING CHEMIST.

By F. J. LLOYD, F.C.S., F.I.C.

It is perhaps not to be wondered at that the number of samples submitted to me by members during the past year is smaller than for very many years, and less than one-third of those sent in 1914.

Feeding Stuffs.—In the whole course of my experience I have never received so many samples of inferior feeding stuffs, as compared with those which were satisfactory. At the prices now being charged for supplementary food materials it is essential they should be of the best quality, in order to give any adequate return for the outlay.

The Fertilisers and Feeding Stuffs Act, while it compelled vendors to give a guarantee of oil and albuminoids, left the very important question of suitability for feeding purposes very much in abeyance. It is true that an official agricultural analyst is expected to state if the material contains an injurious constituent. But that leaves unanswered, and to the discretion of each analyst, the most important question: What is injurious? As is inevitable, upon this point opinions may differ. The following is a striking illustration of how a feeding stuff may come up to the invoice guarantee and yet not be satisfactory. A member sent me a cake which on analysis showed the following composition:—

| | | | | | |
|-----------------|-----|-----|-----|-----|--------------|
| Nutrients— | | | | | |
| Fat | ... | ... | ... | ... | 9.60 |
| Albuminoids | ... | ... | ... | ... | 43.19 |
| Carbohydrates | ... | ... | ... | ... | 25.33 |
| Water | ... | ... | ... | ... | 10.30 |
| Woody fibre | ... | ... | ... | ... | 3.57 |
| *Mineral matter | ... | ... | ... | ... | 8.01 |
| | | | | | <hr/> 100.00 |

When sending the analysis I warned him of what would be the effect of giving this cake to cattle. In reply I received a letter stating "Your estimation is as true as can be; if you had seen the cattle you could not have described their symptoms more accurately." And he estimated his loss at £40.

In a case of this description farmers think they have no guarantee, but I would point out that under the Fertilisers Act the invoice is in itself an implied guarantee that the material is suitable for feeding. In this case, of course, there could be no question as to the material not being suitable, owing to the very excessive amount of sand, the irritating effect of which would be augmented by the high proportion of albuminoids. This is a striking and fortunately uncommon case of an injurious feeding stuff.

* Containing sand, 4.07.

The following is an illustration of a far more frequent difficulty. A dairy cake was sold with the ordinary guarantee of oil and albuminoids. It came up to the guarantee, but it also contained 18.7 per cent. of woody fibre and 2.1 per cent. sand. The sand is certainly above the safety limit, but what is most important is the high proportion of woody fibre. A dairy farmer when he gives ordinary cotton cake knows that it contains about 20 per cent. of woody fibre, and is cautious; but he would scarcely expect that a dairy cake should contain this amount. The same fault is found in some compound cakes. One sample, though rich in oil and albuminoids, contained 21 per cent. of woody fibre.

Mouldy Food.—Another substance about which a word of warning is necessary, as it is largely used by dairy farmers, is barley meal. During the past year I have found this meal to be frequently made from diseased grain, and to be literally swarming with mould spores. These spores in some cases are easily recognised as coming from well-known moulds, and in some cases the spores are also known to be injurious to stock. But in other cases the spores could not be identified. So frequently are samples of barley meal sent to me because they have not given satisfaction or have upset the pigs, which upon analysis are found to be genuine, but made from mouldy material, that I am quite convinced these moulds either contain or have produced in the meal a substance having a poisonous effect upon animals.

It is not merely barley meal which has been found to contain mould spores. The same trouble has been found in meals containing cereal by-products, and even in cakes. Such feeding materials may not be sufficiently injurious to cause trouble, but, as one member put it when forwarding such a material, "It has given very unsatisfactory results."

The most striking case I ever saw was a cotton cake. It did not come from a member, but deserves notice as bearing on the same subject. Externally the cake appeared to be satisfactory. On making the sample and breaking up the cake my attention was drawn to curious white patches in the interior. Upon subsequent examination these were found to consist of spores of a mould. Evidently some cotton meal had become terribly mouldy, had been crushed into cakes, and these, after being rubbed on the outside, looked like genuine cotton cakes.

While the above are illustrations of injurious feeding stuffs which are not suspected of doing harm until after the mischief is done, samples are sometimes sent as suspected to be adulterated because they do not have the appearance anticipated or desired. Thus a member sent a sample of maize meal to be examined microscopically, as sawdust was suspected. But no sawdust was present.

Rice Meal.—A sample was submitted to me, offered at a very tempting price, and said to contain 15 per cent. of carbonate of iron. The vendor stated that this addition was beneficial to stock, and that such meal was largely used in Canada.

Upon analysis the meal was found to contain 26 per cent. of mineral matter. Only a trace of iron was present. The substance was mainly carbonate of lime (chalk), with 6 per cent. of phosphate of lime. The nutrients present were about two-thirds of those present in a good rice meal, so that their feeding value, apart from any other consideration, would only be equal to the price asked. But a meal containing 26 per cent. of mineral matter is not fit for feeding. In this case the carbonate of lime would neutralise the gastric juice, give off large volumes of gas and cause indigestion and flatulence.

Farmers should always beware of apparently cheap food. According to my experience, it is, as a rule, dear at the price demanded, and in some instances, like the above, would be dear at any price.

Apart from the feeding stuffs already referred to, there have been no samples calling for notice.

Soil Analyses.—I may perhaps be allowed to suggest to members that if, in response to the demands for the production of more food, they should think of cultivating land which has of late been out of cultivation, it would be well to first obtain an analysis of such soil. Uncultivated land is generally deficient in some one or more essential constituent. To discover this before cultivating the soil would prove of advantage, and probably make the difference between a profitable and a profitless crop.

The total number of samples analysed during the year was :—

| | | | | | |
|-----------------------------------|-----|-----|-----|-----|-----|
| For members | ... | ... | ... | ... | 91 |
| In connection with the Dairy Show | ... | ... | ... | ... | 199 |

or a total of 290, as compared with 538 in 1914.

British Dairy Farmers' Association.

EXAMINATION FOR THE B. D. F. A. DIPLOMA.

The Association grants to any Candidate who satisfactorily passes the necessary Examinations :—

A Diploma and Silver Medal for Proficiency in the Science and Practice of Dairying and Dairy Farming.

Candidates for the Diploma must have previously obtained the Butter and Cheese-making Certificates of the Association,* and must produce satisfactory evidence that they have received not less than one year's scientific and practical instruction at some recognised centre for Dairying Instruction, and have spent at least twelve months on a farm in addition to the time spent at the Centre.

The Examination will extend over three or more days, and will test (1) the knowledge and experience of the Principles and Practice of Dairying and Dairy Farming, and (2) the skill in making Butter and Cheese, of each Candidate.

Candidates will be required to answer, in writing, sets of questions within a given time, and will also be examined *viva voce*. They will be expected to possess a detailed and precise knowledge of all the subjects included in the following Syllabus. They will have to make both Butter and Cheese. Candidates, if required, must produce their note-books of Lectures and Demonstrations attended.

Examinations for Diploma are held in the Autumn upon dates announced in the Agricultural and Dairy Press.

Entries will close 28 days prior to the date fixed for the Examination.

The Entry Fee is 10s.

SYLLABUS.

1. DAIRYING.

- (a) Milk.—The Yield of Milk from various Breeds; Milking; Handling of Milk from Cow to Dairy; Importance of Cleanliness; Cooling of Milk; Sale of Milk; Influence of Food on the Yield, Flavour, and Fat Contents of Milk; Composition of Milk, Nature and Properties of its Constituents; Differences between Morning and Evening Milk and their Causes; Methods of Sampling and Simple Methods of Testing Milk, as the Lactometer, Creamometer and Centrifugal Fat Testers; Testing for Acidity; Causes of Fermentation; Colostrum, its Nature and Properties; the Keeping of Dairy Records; the Handling of Evening's Milk for Cheese-making; Properties of Milk suitable for Cheese-making; Taints in Milk—their Causes, Effects and Remedies; Tests for such Taints; the Ripening of Milk for Cheese-making; Methods and Reasons for Ripening; use of Natural and "Culture" Starters; Pasteurization of Milk; Chilled Milk: their Subsequent Use for Cheese-making; Special Testing of Milk, Whey, and Curd requisite in a Cheese Dairy.
- (b) Cream.—The Various Methods of obtaining Cream; the Construction and Use of the Utensils Employed; Separators, the Construction and Use of the various Types; Composition of Cream, Separated Milk, Skimmed Milk and Butter-milk, with Simple Tests for Fat in same; the Ripening of Cream, Objects and Results; Changes during Ripening; Testing for Acidity; Natural and Artificial Ripening and Preparation of Starters; the Preparation of Cream for Churning; Preparation of Cream for Sale; Clotted Cream.

*Equivalent Certificates of recognised bodies will be accepted by the Association as evidence of sufficient training to justify entry for this Examination.

- (c) Butter.—The Various Methods of obtaining Butter, including the Churning of Whole Milk; Utensils required and the Preparation, Use and Care of same; the Process of Butter Manufacture in all its Details; Conditions which affect the Butter Yield; Circumstances affecting the Flavour, Texture, Colour and Keeping Properties of Butter; Dry-salting and Curing of Butter; Faults in Butter and their Causes; Composition and Properties of Good Butter; Composition and Causes of Inferior Butter; Methods of Judging Butter.
- (d) Cheese.—Rennet: its Preparation, Properties, and Action upon Milk; Testing its Strength; Storage of Rennet; Substitutes for Rennet; Annatto; the Colouring; Discoloration of Cheese; a General Knowledge of the Manufacture of the Principal Varieties of Hard-pressed, Blue-veined, and Soft Cheeses including the use of Wood and Metal Tubs and Jacketed Vats; Methods of Scalding; the Development and Control of Acidity in Curd; Salting and Brining in Cheese-making; Bandaging; Ripening and Storing of Hard-pressed, Blue-veined and Soft Cheeses; Defects in Cheese and their Causes; Composition of Cheese; Composition and Utilization of Whey; the Manufacture of Whey Butter; the Equipment of a Cheese Dairy and its Cost; the Care of Utensils.

Candidates will be required to make one Hard-pressed Cheese, either Cheddar, Cheshire, or Derby, to be selected by the Examiner, and one Blue-veined Cheese, either Stilton or Wensleydale, to be selected by the Candidate. They must also have a knowledge of the manufacture of other varieties of Hard-pressed Cheese, and of Soft Cheese.

2. DAIRY FARMING.

(a) The General Principles and Practice of Dairy Farming; the Management and Equipment of a Dairy Farm.

(b) Agricultural Botany.—Appearance and Identification of the Common Varieties of Grasses and other Pasture Plants and Weeds. Their Effects upon Milk and Dairy Produce.

(c) Crops.—A General Knowledge of the Cultivation, Manuring, and Harvesting of Farm Crops with a Special Knowledge of those Crops employed in the Feeding of Dairy Stock; the Management of Pasture and Meadow Land; Haymaking and Ensilage: the Factors which bear on their value as Fodder for Stock.

(d) Foods and Feeding.—The Effect of various Foods on Milk and its Products; Systems of Feeding and the Compilation of Rations.

(e) Live Stock.—Characteristics and Management of Different Breeds of Cattle; their Breeding and Rearing; Choice of Dairy Cattle for Special Purposes and Situations; Pigs and Poultry; Suitable Breeds for Use in Connection with a Dairy Farm and their Management; Horses.

(f) Diseases of Dairy Stock, such as: Tuberculosis, Anthrax, Foot and Mouth Disease, Contagious and Sporadic Abortion, Chronic and Acute Indigestion, Mastitis, Milk Fever, Sore Teats, Husk, Diarrhoea, White Scour in Calves, Common Causes of Poisoning.

(g) Physiology of Digestion and Milk Secretion.

(h) Buildings suitable for a Dairy Farm: their Situation, Construction, Ventilation, Drainage, &c.; Water Supply.

(i) Book-keeping on a Dairy Farm; Milk Records; Business Methods involved in Dairying and Dairy Farming.

(k) Farm Implements and Machines; their construction and use.

3. AGRICULTURAL CHEMISTRY.

(a) General.—The Chemical Elements and Constituents found in Milk, Soils, Plants, Manures, Animals and Foods: their Nature and Properties so far as they relate to Agriculture; the simpler Laws of Chemical Combination and Change so far as regards these Substances.

(b) Dairy.—The Composition and Properties of Milk, Cream, Butter, Cheese, and Dairy Products, and of all Substances used in the Dairy; Simple Methods of Analysis as applied to these Substances; the Chemical Changes which may take place in Milk, Cream, Butter, &c.

(c) Agricultural.—The Composition and the Chief Chemical and Physical Properties of Soils, and their Constituents; the Chemical Means of Ameliorating the Soil; the Source, Composition, and Use of the usual Natural and Artificial Manures; the Chemistry of Plant Growth; the Composition of Crops; the Source, Composition, and Use of Artificial Feeding Stuffs; Drinking Waters; the Chemistry of Animal Nutrition.

4. AGRICULTURAL BACTERIOLOGY.

(a) General.—Bacteria, their Form, Classification, Growth and Reproduction; The Microscope and its Use; Staining and Microscopic Examination of Bacteria; Methods of Isolation and Cultivation; Preparation of Culture Media; Fermentations and Chemical Changes produced by Bacteria; Enzymes and their Action; Effects of Heat, Cold, Sterilization, Pasteurization, Disinfectants, and Preservatives on Bacteria and Enzymes.

(b) Dairy Bacteriology.—The Bacteria of Milk and Dairy Products; Examination of Milk for Foreign Bodies, Sediment, Blood, Pus, and Pathogenic Organisms; the Bacteriology of Milk, Cream, Butter, and Cheese; Commercial Bacterial Preparations for use in the Dairy; Bacteria Injurious to Dairy Produce: their Source, Nature, and Treatment.

(c) Agricultural Bacteriology.—The Bacteria of the Soil; Bacteriological Examination of Soils, Air, Water, &c.; Action of Heat and Antiseptics on Soil Bacteria; Nitrification; Bacteriology of Farmyard and other Manures; Plant Bacteria and Assimilation of Nitrogen.

(d) Fungi (Moulds) and Yeasts.—Their Forms, Classification, and Growth; their Relation to Dairy Produce, to Soils and Plants, and to Feeding Stuffs.

Particulars and Entry Forms may be obtained from

The SECRETARY,

BRITISH DAIRY FARMERS' ASSOCIATION,

28, Russell Square, London, W.C.

EXAMINATION FOR DAIRY TEACHER'S CERTIFICATE.

The Association grants to any Candidate who satisfactorily passes the necessary Examinations :—

A Teacher's Certificate for Proficiency in the Science and Practice of Dairying.

Candidates for this Certificate must have previously obtained the Butter and Cheese-making Certificates of the Association,* and must produce satisfactory evidence that they have received not less than twelve months' instruction at a recognised centre for dairy instruction.

The Examination will extend over three or more days, and will test (1) The Theoretical Knowledge of the Candidates; (2) their skill in making Butter and Cheese; and (3) their ability to teach and elucidate the Elementary Principles and Practice of Dairying.

Candidates will be required to answer, in writing, sets of questions within a given time, and will also be examined *via voce*. They will be expected to possess a detailed and precise knowledge of the subjects included in the following Syllabus, together with a fair knowledge of the General Management and Feeding of Dairy Cattle. They must produce a Certificate of their ability to milk. Candidates, if required, must produce their note-books of Lectures and Demonstrations attended.

Examinations for Teacher's Certificates are held in the Autumn, upon dates announced in the Agricultural and Dairy Press.

Entries will close 28 days prior to the date fixed for the Examination.

The Entry Fee is 10s.

SYLLABUS.

1. Milk.—The Yield of Milk from various breeds; Milking; Handling of Milk from cow to dairy; Importance of Cleanliness; Cooling of milk; Sale of Milk; Influence of Foods on the Yield, Flavour, and Fat Contents of Milk; Composition of Milk, Nature and Properties of its Constituents; Differences between Morning and Evening Milk and their causes; Methods of Sampling, and Simple Methods of Testing Milk, as the Lactometer, Creamometer, and Centrifugal Fat Testers; Testing for Acidity; Causes of Fermentation; Colostrum, its Nature and Properties; the Keeping of Dairy Records; the Handling of Evening's Milk for Cheese-making; Properties of Milk suitable for Cheese-making; Taints in Milk, their Causes, Effects and Remedies; Tests for such Taints; the Ripening of Milk for Cheese-making; Methods and Reasons for Ripening; Use of Natural and "Culture" Starters; Pasteurization of Milk; Chilled Milk: their subsequent Use for Cheese-making; Special Testing of Milk, Whey, and Curd requisite in a Cheese Dairy.
2. Cream.—The Various Methods of Obtaining Cream; the Construction and Use of the Utensils employed; Separators, the Construction and Use of the various Types; Composition of Cream, Separated Milk, Skimmed Milk, and Butter-milk, with Simple Tests for Fat in same; the Ripening of Cream: Objects and Results; Changes during Ripening, Testing for Acidity; Natural and Artificial Ripening and Preparation of Starters; the Preparation of Cream for Churning; Preparation of Cream for Sale; Clotted Cream.
3. Butter.—The Various Methods of obtaining Butter, including the Churning of Whole Milk; Utensils required and the Preparation, Use and Care of

*Equivalent Certificates of recognised bodies will be accepted by the Association as evidence of sufficient training to justify entry for this Examination.

same; the Process of Butter Manufacture in all its details; Conditions which affect the Butter Yield; Circumstances affecting the Flavour, Texture, Colour and Keeping Properties of Butter; Dry-salting and Curing of Butter; Faults in Butter and their causes; Composition and Properties of Good Butter; Composition and Causes of Inferior Butter; Methods of Judging Butter.

4. Cheese.—Rennet: its Preparation, Properties, and Action upon Milk: Testing its Strength; Storage of and Substitutes for Rennet; Annatto; the Colouring of Cheese; Discoloration; a General Knowledge of the Manufacture of the Principal Varieties of Hard-pressed, Blue-veined, and Soft Cheeses, including the use of Wood and Metal Tubs and Jacketed Vats; Methods of Scalding; the Development and Control of Acidity in Curd; Salting and Brining in Cheese-making; Bandaging; Ripening and Storing of Hard-pressed, Blue-veined, and Soft Cheeses; Defects in Cheese and their Causes; Composition of Cheese; Composition and Utilization of Whey; the Manufacture of Whey Butter; the Equipment of a Cheese Dairy, and its Cost; the Care of Utensils.

Candidates will be required to make one Hard-pressed Cheese, either Cheddar, Cheshire, or Derby, to be selected by the Examiner, and one Blue-veined Cheese, either Stilton or Wensleydale, to be selected by the Candidate. They must also have a knowledge of the manufacture of other varieties of Hard-pressed Cheese, and of Soft Cheese.

5. Dairy Farming.—Its General Principles, Practice, and Management.
6. Food and Feeding Stuffs.—Suitable and Unsuitable Foods; Suitable Rations; Preparation of Food for Dairy Stock
7. General Book-keeping of a Dairy.
8. The Method of Organising an Itinerant Dairy Class.
9. DAIRY CHEMISTRY.—The Chemical Elements and Constituents found in Milk, Animals and Foods; their Nature and Properties so far as they relate to Dairying; the Composition, and the Properties of the Constituents of Milk, Cream, Butter, Cheese, and Dairy Products, and of all Substances used in the Dairy; Simple Methods of Analysis as applied to these Substances; the Chemical Changes which may take place in Milk, Cream, Butter, &c.
10. DAIRY BACTERIOLOGY.

(a) Bacteria, their Form, Classification, Growth and Reproduction; The Microscope and its Use; Staining and Microscopic Examination of Bacteria; Methods of Isolation and Cultivation; Preparation of Culture Media; Fermentations and Chemical Changes produced by Bacteria; Enzymes and their Action; Effects of Heat, Cold, Sterilization, Pasteurization, Disinfectants, and Preservatives on Bacteria and Enzymes.

(b) The Bacteria of Milk and Dairy Products; Examination of Milk for Foreign Bodies, Sediment, Blood, Pus, &c.; the Bacteriology of Milk, Cream, Butter and Cheese; Commercial Bacterial Preparations for Dairy use; Bacteria Injurious to Dairy Produce—their Source, Nature, and Treatment.

(c) Fungi (Moulds) and Yeasts.—Their Forms, Classification, and Growth; their Relation to Dairy Produce.

Particulars and Entry Forms may be obtained from

The SECRETARY,

BRITISH DAIRY FARMERS' ASSOCIATION,

28, Russell Square, London, W.C.

EXAMINATION FOR CHEESEMAGING CERTIFICATE.

The Association grants to any Candidate who satisfactorily passes the necessary Examination—

A Certificate of Merit for Proficiency in the Theory and Practice of Cheese-making.

The Examination, which will extend over two or more days, will test the Theoretical Knowledge of the Candidates and their Practical Skill in Cheesemaking. Each Competitor will be required to answer, in writing, a set of questions within a given time, and will also be examined *viva voce*. On the same or following day a Practical Examination in Cheesemaking will take place.

Candidates for this Certificate must, at the time of entry, produce satisfactory evidence that they have received at least twelve months' instruction in the Theory and Practice of Cheesemaking, of which at least six months must have been spent at a recognised centre for dairy instruction. They must possess a fair knowledge of the subjects included in the following Syllabus.

Candidates will be required to make one Hard-pressed Cheese, either Cheddar, Cheshire or Derby, to be selected by the Examiner, and one Blue-veined Cheese, either Stilton or Wensleydale, to be selected by the Candidate. They must also have a knowledge of the manufacture of other varieties of Hard-pressed Cheese and of Soft Cheese.

Candidates are at liberty to bring their own utensils for the Practical Examination if they wish to do so.

Examinations for Cheesemaking Certificates are held twice a year, viz., in the Spring and Autumn, upon dates announced in the Agricultural and Dairy Press.

Entries will close 28 days prior to the date fixed for the Examination.

The Entry Fee is 5s.

SYLLABUS.

1. Milk.—The Yield of Milk from various breeds; Milking; Handling of Milk from Cow to Dairy; Importance of Cleanliness; Cooling of Milk; Influence of Food on the Yield, Flavour and Fat Contents of Milk; Composition of Milk, Nature and Properties of its Constituents; Differences between Morning and Evening Milk and their Causes; Methods of Sampling and Simple Methods of Testing Milk, as the Lactometer, Creamometer, Centrifugal Fat Testers; Testing for Acidity; Causes of Fermentation; Colostrum, its nature and properties; the Keeping of Dairy Records; the Handling of Evening's Milk for Cheesemaking; Properties of Milk suitable for Cheesemaking; Taints in Milk, their Causes, Effects and Remedies; Tests for such Taints; the Ripening of Milk for Cheesemaking; Methods and Reasons for Ripening; use of Natural and "Culture" Starters; Pasteurization of Milk; Chilled Milk; their Subsequent use for Cheesemaking; Special Testing of Milk, Whey, and Curd requisite in a Cheese Dairy.

2. Cheese.—Rennet: its Preparation, Properties, and Action upon Milk; Testing its Strength; Storage of and Substitutes for Rennet; Annatto; the Colouring of Cheese; Discoloration; a General Knowledge of the Manufacture of the Principal Varieties of Hard-pressed, Blue-veined, and Soft Cheeses, including the use of wood and metal tubs and jacketed vats; Methods of Scalding; the Development and Control of Acidity in Curd; Salting and Brining in Cheese-making; Bandaging; Ripening and Storing of Hard-pressed, Blue-veined and Soft Cheeses; Defects in Cheese and their causes; Composition of Cheese; Composition and Utilization of Whey; the Manufacture of Whey Butter; the Equipment of a Cheese Dairy and its Cost; the care of Utensils; the Detailed Principles and Practice requisite for the Manufacture of one of the following types of Cheese—to be selected and made by the Candidate :—

(a) A Hard-pressed British Cheese (not less than 25 lbs. weight).

(b) A Blue-veined British Cheese (not less than 10 lbs. weight).

Particulars and Entry Forms may be obtained from

The SECRETARY,

BRITISH DAIRY FARMERS' ASSOCIATION,

28, Russell Square, London, W.C.

EXAMINATION FOR BUTTERMAKING CERTIFICATE.

The Association grants to any Candidate who satisfactorily passes the necessary Examination—

A Certificate of Merit for Proficiency in the Theory and Practice of Butter-making.

The Examination, which will extend over two or more days, will test the Theoretical Knowledge of the Candidates and their Practical Skill in Buttermaking. Each Competitor will be required to answer, in writing, a set of questions within a given time, and will also be examined *viva voce*. On the same or following day a Practical Examination in Buttermaking will take place.

Candidates for this Certificate must, at the time of entry, produce satisfactory evidence that they have received at least three months' instruction (not necessarily at a Dairy School) in the Theory and Practice of Buttermaking. They must possess a fair knowledge of the subjects included in the following Syllabus. They will be required to make Butter.

Candidates are at liberty to bring their own utensils for the Practical Examination if they wish to do so.

Examinations for Buttermaking Certificates are held twice a year, viz., in the Spring and Autumn, upon dates announced in the Agricultural and Dairy Press.

Entries will close 28 days prior to the date fixed for the Examination.

The Entry Fee is 5s.

SYLLABUS.

1. Milk.—The Yield of Milk from various breeds; Milking; Handling of Milk from cow to dairy; Importance of Cleanliness; Cooling of Milk; Sale of Milk; Influence of Foods on the Yield, Flavour and Fat Contents of Milk; Composition of Milk, Nature and Properties of its constituents; Differences between Morning and Evening Milk and their causes; Methods of Sampling and Simple Methods of Testing Milk, as the Lactometer, Creamometer, and Centrifugal Fat Testers; Testing for Acidity; Causes of Fermentation; Colostrum, its nature and properties; the Keeping of Dairy Records.
2. Cream.—The Various Methods of Obtaining Cream; the Construction and Use of the Utensils employed; Separators, the Construction and Use of any one Type; Composition of Cream, Separated Milk, Skimmed Milk, and Butter-milk, with Simple Tests for Fat in same; the Ripening of Cream—Objects and Results; Changes during Ripening; Testing for Acidity; Natural and Artificial Ripening and Preparation of Starters; the Preparation of Cream for Churning; Preparation of Cream for Sale; Clotted Cream.
3. Butter.—The Various Methods of Obtaining Butter, including the Churning of Whole Milk; Utensils required, and the Preparation, Use, and Care of same; the Process of Butter Manufacture in all its details; Conditions which affect the Butter Yield; Circumstances affecting the Flavour, Texture, Colour, and Keeping Properties of Butter; Dry-salting and Curing of Butter; Faults in Butter and their causes; Composition and Properties of Good Butter; Composition and Causes of Inferior Butter; Methods of Judging Butter.

Particulars and Entry Forms may be obtained from

THE SECRETARY,

BRITISH DAIRY FARMERS' ASSOCIATION,

28, Russell Square, London, W.C.

EXAMINATION FOR FACTORY MANAGER'S CERTIFICATE.

Regulations and Syllabus, viz. :—

Candidates must hold the British Dairy Farmers' Diploma, or Teachers' Certificate, or the National Dairy Diploma.

They must have subsequently spent at least six summer months as Assistant in a Factory dealing with not less than 500 gallons of milk daily.

Candidates will write answers to a paper and be examined orally and practically on the following :—

1. Factory: the Site, Construction and Requirements of a Factory.
2. Lighting and Power in the Factory.
3. Boilers, Engines, Shafting, Fittings, and Apparatus, their disposition and control.
4. Maintenance and Cleansing of Factory and disposal of Waste.
5. Organisation of Labour and use of Labour-saving Devices.
6. Milk, management of, on arriving at Factory: Weighing, Sampling Testing, Recording, Cleaning, &c.
7. Methods of dealing with the Milk for (a) Sale; (b) Cream Production; (c) Buttermaking; (d) Cheesemaking; (e) Condensing.
8. Refrigerating Machinery and its use.
9. Cold Stores and their Management.
10. Pasteurising and Sterilising Machinery and its use.
11. Cream, preparation of, for Market.
12. Butter: Manufacture and Treatment.
13. Cheese: Manufacture and Treatment.
14. Utilisation of Bye-products.
15. Pig-keeping.
16. Business Management; Book-keeping; Stocktaking and Depreciation; Contracts; Railway Rates and Conditions; Statements; Notices, &c.
17. Law, so far as it affects the Factory, the Management, and the Produce, including main provisions of Factory and Workshop Act; Workmen's Compensation; Health Insurance; Employers' Liability; Rivers Pollution Act; Industrial and Provident Societies Act; Sale of Food and Drugs Act; Milk and Dairies Acts, and other Legislation as it affects the Working of Factories and the Manufacture and Sale of Dairy Produce.

The Entry Fee for each Candidate is fixed at £4 4s.

Particulars and Entry Forms may be obtained from

THE SECRETARY,

BRITISH DAIRY FARMERS' ASSOCIATION,

28, Russell Square, London, W.C.

EXAMINATIONS

AT

LOCAL CENTRES.

In order to meet the convenience of Students at Dairy Schools, members of local Societies, and other persons, the Association will conduct Examinations for its Diplomas and Certificates at any place in the United Kingdom upon receiving satisfactory proof that the following conditions will be observed :—

That the School, Society, County Council, or other body requesting such an Examination to be held, undertake :—

- (1) To supply all necessary appliances and materials.
 - (2) To pay the fees and expenses of the Examiners.
 - (3) To supply the milk required free from preservatives and fit for Cheesemaking.
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Copies of Question Papers set at recent examinations may be obtained at 3d. per copy.

Applicants are requested to state whether Diploma, Cheese, or Butter Questions are required.

Further particulars and Entry Forms for Students may be obtained from
The SECRETARY,

BRITISH DAIRY FARMERS' ASSOCIATION,

23, Russell Square, London, W.C.

EXAMINATION FOR BUTTERMAKING CERTIFICATES AT
THE UNIVERSITY COLLEGE OF SOUTH WALES AND
MONMOUTHSHIRE, CARDIFF; ON THURSDAY AND
FRIDAY, MAY 20TH AND 21ST, 1915.

EXAMINER: F. J. LLOYD, F.C.S., F.I.C.

Three hours are allowed for this paper.

Candidates will also be examined *viva voce* by the Examiner. Each question carries the same number of marks, and candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible, brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner. The top sheet should bear the name and number of the candidate.

QUESTIONS.

1. Why is it important that milk should be obtained in as cleanly a way as possible?
2. If milk were being supplied by several farmers to a butter factory, what tests could you apply to estimate the cleanliness of each consignment?
3. Is acidity a test of ripeness in cream? State what should be the lowest, highest, and average acidity for churning?
4. Given two milks, one containing 3.5% fat and the other 5.5% of fat; what proportion of fat would you expect in the cream, separated milk, and buttermilk from each?
5. What objects are supposed to be attained by using a starter?
6. Explain the origin of the flavour of butter.
7. If given four samples of butter, how would you decide which was best?
8. What are the chief causes of inferior butter, and why?
9. Give the average composition of the morning's and evening's milk from an ordinary herd at this time of the year?
10. Genuine milk sometimes contains less than 3% fat and sometimes less than 8.5% other solids: what are the chief causes for each?

EXAMINATION FOR CHEESEMAKING CERTIFICATES AT
THE BRITISH DAIRY INSTITUTE, READING; ON
TUESDAY, WEDNESDAY, AND THURSDAY, JUNE
15TH, 16TH, AND 17TH, 1915.

EXAMINERS: JOSEPH RIGBY and F. J. LLOYD, F.C.S., F.I.C.

Three hours are allowed for this paper.

Candidates will also be examined *viva voce* by each Examiner. Each question carries the same number of marks, and Candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in the left-hand corner. The top sheet should bear the name of the Candidate.

QUESTIONS.

1. What is the usual difference between the composition and character of milk from low (marshy) land and that from high (hilly) pastures?
2. How does this difference affect the process of cheesemaking? (State variety.)
3. Describe the testing of milk for acidity, and what degree of ripeness do you favour at the time of renneting?
4. Describe the action of "starters" on the curd in the process of cheesemaking.
5. Describe favourable and unfavourable conditions of milk which influence the action of rennet and annatto.
6. Why is curd scalded? Describe (1) good and (2) careless methods of scalding.
7. What difference is there in the texture of curds (1) over acid, (2) under acid, and (3) just sufficiently acid?
8. Describe the action of salt on curd. Under what conditions would you vary the quantity used?
9. What are the common defects in cheese, and what are their causes?
10. Give a short description of the making of either (1) Cheddar, (2) Cheshire, or (3) Derby cheese.

EXAMINATION FOR BUTTERMaking CERTIFICATES AT
THE BRITISH DAIRY INSTITUTE, READING; ON
TUESDAY, WEDNESDAY, AND THURSDAY, JUNE 15TH,
16TH, AND 17TH, 1915.

EXAMINERS: C. W. WALKER TISDALE
AND F. J. LLOYD, F.C.S., F.I.C.

Three hours are allowed for this paper.

Candidates will also be examined *viva voce* by each Examiner. Each question carries the same number of marks, and candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner. The top sheet should bear the name of the candidate.

QUESTIONS.

1. Explain carefully how you use the Creamometer and the Lactometer, and state what each tells you.
2. Which is the richer milk, morning's or evening's? State the causes for this difference.
3. Why is cream ripened for churning; what changes take place; and what advantages are obtained?
4. A sample of Separated Milk when tested is shown to contain 0.5 per cent. of Butter Fat. What might be the causes of this and what remedies would you apply?
5. If you are separating Cream for sale what percentage of Cream would you usually take off, and what percentage of Fat in the Cream would you aim at obtaining?
6. State briefly the causes of "Streaky" or "Mottled" Butter, and explain how this fault may be easily avoided.
7. If you are asked to judge several samples of Butter and place them in order of merit, explain briefly how you would do this.
8. What advantages, if any, has the use of a Starter in Cream ripening as compared with natural ripening?
9. Has the Cylindrical Butter Dryer any advantages over the ordinary Butter Worker? State the merits of each.
10. If you were asked to advise in a case where, after churning three hours, no Butter was obtained, what would you recommend?

EXAMINATION FOR DAIRY TEACHERS' CERTIFICATES AT
THE DAIRY DEPARTMENT, COUNTY LABORATORIES,
CHELMSFORD; ON MONDAY, TUESDAY, AND
WEDNESDAY, JULY 19TH, 20TH, AND 21ST, 1915.

EXAMINERS: MR. ALEC TODD and MR. F. J. LLOYD, F.C.S.

Dairy Teacher Candidates will be allowed 2 hours to answer the following questions:—

1. What would guide you in taking a farm suitable for dairying purposes, and what are the essential differences between a milk-selling and a cheesemaking farm?
2. Give a suitable ration for a shorthorn cow in full milk in the month of November.
3. What is meant by the terms Day Book, Cash Book, and Ledger, as applied to a dairy or cheese factory?
4. How would you organise a class of six students for a ten days' course in butter-making and soft cheese-making, and what sort of a plant would you require?
5. Describe fully the chemical changes which take place in the souring of milk.
6. Explain the construction and use of the acidimeter as you would to a class.
7. The growth and activity of bacteria depend upon certain conditions: enumerate these, and for each one state what use is made of it in dairying.
8. Describe the coli bacteria, and explain why they are injurious to dairy produce.

EXAMINATION FOR CHEESEMAKING AND DAIRY
TEACHERS' CERTIFICATES AT THE DAIRY DEPART-
MENT, COUNTY LABORATORIES, CHELMSFORD; ON
MONDAY, TUESDAY, AND WEDNESDAY, JULY 19TH,
20TH, AND 21ST, 1915.

EXAMINERS: MR. ALEC TODD and MR. F. J. LLOYD, F.C.S.

Two hours are allotted to Candidates to answer the questions contained on this sheet.

Candidates will also be examined *viva voce*. Each question carries the same number of marks, and Candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner.

QUESTIONS.

1. What do you know of the advantages or disadvantages of the factory system of making cheese?
2. Why is the milk for Cheddar cheese making ripened before renneting, and if Stilton cheese were made of ripened milk what would be the effect on the cheese?
3. Given two vats of milk to be made into cheese, one showing .4 per cent. of acidity and the other .18 per cent., what difference would you make in their treatment?
4. What difference would you make in the making of cheese in June and October?
5. Why are hard-pressed cheeses scalded or heated in the process of making? What would guide you to fix the maximum or minimum scald?
6. What is the average composition of:—
 - (a) Shorthorn milk?
 - (b) Cheddar cheese?
 - (c) Whey from Cheddar cheese?
 - (d) Stilton cheese?
7. Describe some of the conditions you would impose upon farmers supplying milk to a cheese factory, and what system would you adopt in purchasing such milk?
8. What tests can be applied to milk intended for cheesemaking to show its suitability?
9. What are the chief causes of cheese showing holes when ripe?
10. How would you make rennet, and what precautions are necessary?

EXAMINATION FOR BUTTERMILKING AND DAIRY
TEACHERS' CERTIFICATES AT THE DAIRY DEPART-
MENT, COUNTY LABORATORIES, CHELMSFORD; ON
MONDAY, TUESDAY, AND WEDNESDAY, JULY 19TH
20TH, AND 21ST, 1915.

EXAMINERS: MR. ALEC TODD and MR. F. J. LLOYD, F.C.S.

Two hours are allotted to Candidates to answer the questions contained on this sheet.

Candidates will also be examined *vis à voce*. Each question carries the same number of marks, and Candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the hand corner.

QUESTIONS.

1. To what extent do the constituents of milk vary above and below the normal?
2. What are the chief causes of these fluctuations in the composition of milk?
3. What methods for obtaining cream are you practically acquainted with? State for each the chief precautions to take to prevent loss of fat.
4. What is your object in ripening cream?
5. Assuming that you could not quite control the ripening, would it be better to use it under-ripe or over-ripe, and why?
6. State fully why you stir cream when it is ripening, and how this should be done.
7. Why do you ventilate the churn when churning?
8. What is the chief cause of rancid butter?
9. What are the chief characteristics of well-made butter of good keeping quality?
10. What is a starter? Why is it used for buttermaking, and how do you explain the fact that excellent butter was made before ever starters were heard of?

EXAMINATION FOR DIPLOMAS AT THE BRITISH DAIRY
INSTITUTE, READING; ON TUESDAY, WEDNESDAY,
AND THURSDAY, SEPTEMBER 21st, 22nd, AND 23rd, 1915.

EXAMINERS: MR. JOSEPH RIGBY, MR. C. W. WALKER-TISDALE,
and MR. F. J. LLOYD, F.C.S.

Three hours are allotted to candidates for DIPLOMAS to answer the questions contained on this sheet.

Candidates will also be examined *viva voce*. Each question carries the same number of marks, and candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner.

DAIRY FARMING QUESTIONS.

1. State what at prevailing prices you would consider the best and most economical daily ration for a cow in full milk during winter.
2. What is basic slag? Give the composition of the various grades on the market. What quantity would you apply, and what would be the effect produced on poor quality pasture land?
3. Two brands of cake of similar kind are offered to you. No. 1 contains 24% albumenoids, 6% oil, and 30% carbohydrates, price £8 a ton. No. 2, 20% albumenoids, 6% oil, and 28% carbohydrates, price £7 10s. a ton. Show by calculation which is the cheaper. State any of the points to be taken into consideration in purchasing, so as to obtain the best value.
4. What are the indications of tuberculosis in stock? State what action public authorities are entitled to take where the milk sold from a farm is found to contain tubercle bacilli.
5. Give the approximate composition of the various kinds of straw which can be used for feeding to dairy cows, and state which is of most value.
6. Given a 200-acre dairy farm (one-third arable) where cheese is the chief product. How many cows would you keep, and how much cheese would you expect to make annually?
7. Give your system of rotation of cropping on such a farm.
8. What kinds of artificial manure would be chiefly used, and to what crops would you apply them?
9. What would be the required (a) manual, (b) horse labour, and what would be the cost in each case?
10. Compare the profit and loss of making calves into veal (worth 11d. per lb.) at two months old, (a) with selling the milk at 9d. per gallon, and (b) with the ordinary rearing of calves intended for stores.

EXAMINATION FOR DIPLOMAS AND DAIRY TEACHERS'
CERTIFICATES AT THE BRITISH DAIRY INSTITUTE,
READING; ON TUESDAY, WEDNESDAY, AND THURS-
DAY, SEPTEMBER 21ST, 22ND, AND 23RD, 1915.

EXAMINERS: MR. JOSEPH RIGBY, MR. C. W. WALKER-TISDALE,
and MR. F. J. LLOYD, F.C.S.

Two hours are allotted to Candidates to answer the questions contained on this sheet.

Candidates will also be examined *viva voce*. Each question carries the same number of marks, and Candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner.

DAIRY CHEMISTRY AND DAIRY BACTERIOLOGY QUESTIONS.

1. What nitrogenous constituents are found in milk?
2. Explain what chemical changes take place to produce butyric acid in milk or milk products.
3. All exceptional results of chemical tests should be checked by a second method. Assuming a Gerber fat result is exceptional, how could you check it?
4. It is of importance that the standard soda solution used for acidity tests should be checked regularly. How would you do this?
5. Describe how you would microscopically examine the bacteria, &c., in cheese.
6. If you were doubtful as to the purity of a so-called "pure culture," what would be the simplest tests you could apply to determine its purity and suitability?
7. What evidence is there that bacteria (dairy) secrete enzymes?
8. Compare the chemical changes produced by bacteria and moulds respectively in a soft cheese, *e.g.*, Camembert.

EXAMINATION FOR DIPLOMAS AND DAIRY TEACHERS'
CERTIFICATES AT THE BRITISH DAIRY INSTITUTE,
READING; ON TUESDAY, WEDNESDAY, AND THURS-
DAY, SEPTEMBER 21ST, 22ND, AND 23RD, 1915.

EXAMINERS : MR. JOSEPH RIGBY, MR. C. W. WALKER-TISDALE,
and MR. F. J. LLOYD, F.C.S.

Three hours are allotted to Candidates to answer the questions contained on this sheet.

Candidates will also be examined *viva voce*. Each question carries the same number of marks, and Candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner.

DAIRYING QUESTIONS.

1. Assume that a herd of 12 cows (non-pedigree Shorthorns) is kept for buttermaking.

Draw up returns to show the value of the butter, separated milk, and buttermilk produced in twelve months.

2. What would be the percentage of butter yielded from cream containing 30 per cent. of fat?
3. Buttermilk is found to contain 4 per cent. of fat. State the possible causes of this, and the preventive and remedial measures to adopt.
4. What is ropy or slimy milk? Name the causes, and how you would prevent its recurrence.
5. Explain how as an Itinerant Instructor you would organise and conduct a ten days' class in buttermaking.
6. State which are the chief chemical terms you would have to employ to an elementary class (ten-day) and how you would explain them.
7. Write a synopsis of a talk to cheese students on "acidity" and its importance.
8. State what changes are produced in milk by pasteurization, and their subsequent effects on the use of such milk.

EXAMINATION FOR CHEESEMAKING CERTIFICATES AT
THE BRITISH DAIRY INSTITUTE, READING; ON
TUESDAY, WEDNESDAY, AND THURSDAY, SEP-
TEMBER 21ST, 22ND, AND 23RD, 1915.

EXAMINERS: MR. JOSEPH RIGBY and Mr. F. J. LLOYD, F.I.C., F.C.S.

Two hours are allotted to candidates to answer the questions contained on this sheet.

Candidates will also be examined *viva voce*. Each question carries the same number of marks, and candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible — brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner.

1. Describe the variation in treatment of the night's milk intended for cheesemaking in spring, summer, and autumn.
2. If the night's milk is found to be (a) over-ripe, (b) under-ripe, in the morning, how do you change the course of making, so as in each case to produce a good average cheese?
3. How do you determine the right time to draw the whey off the curd?
4. Describe the cutting and scalding of curd. Under what conditions do you vary these operations?
5. Give the acidities desirable at the time of grinding in curd intended for Cheshire, Cheddar, Derby, and Leicester cheese.
6. Which do you consider the more important
 - (a) The amount of acidity in the curd at the time of drawing the whey; or
 - (b) The dryness of the curd?Give your reasons.
7. Describe the difference in the texture of two curds, the one intended for early-ripening cheese, the other for long-keeping cheese.
8. How are errors in making discerned while the cheese is in press? Explain some of them.
9. Describe the making and ripening of Stilton cheese.
10. Describe the texture, flavour, and colour of sound, ripe cheese of the Cheddar, Derby, and Stilton types.

EXAMINATION FOR BUTTERMAKING CERTIFICATES AT
THE BRITISH DAIRY INSTITUTE, READING; ON
TUESDAY, WEDNESDAY, AND THURSDAY, SEPTEMBER
21ST, 22ND, AND 23RD, 1915.

EXAMINERS: MR. C. W. WALKER-TISDALE and MR. F. J. LLOYD,
F.I.C., F.C.S.

Two hours are allotted to Candidates to answer the questions contained on this sheet.

Candidates will also be examined *visu voce*. Each question carries the same number of marks, and Candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner.

1. What yield of butter would you expect to obtain from a herd of 12 cows (non-pedigree Shorthorns) in a year, and what would be the return per cow, valuing the butter at 1s. 4d. per lb.?
2. What is colostrum? State its composition, and why it is undesirable to use it for buttermaking.
3. Explain the process of churning, and state all the points which may cause:—
 - (a) The churning to be unduly prolonged.
 - (b) The butter to "come" in a very short time.
4. If it takes 27 lb. of milk to produce 1 lb. of butter, show by calculation the percentage of fat present in the milk (assuming an average loss of 0.2 per cent. in separating and churning).
5. Explain why in some cases cream is churned in a "sweet" and in others in a "ripened" condition, and state the advantages of each.
6. Name any common fault in butter, and state the preventive measures to be taken to avoid it.
7. What is centrifugal force? State all the ways in which it is utilised in practical dairy work.
8. State all the points essential to produce butter possessing good keeping qualities.
9. Explain the terms acidity, percentage, and specific gravity.
10. What differences occur between morning's and evening's milk, and what are the causes thereof?

EXAMINATION RESULTS, 1915.

EXAMINATION FOR BUTTERMILKING CERTIFICATES AT THE UNIVERSITY COLLEGE OF SOUTH WALES AND MONMOUTHSHIRE, CARDIFF, ON THURSDAY AND FRIDAY, MAY 20TH AND 21ST, 1915.

- A Certificate of Merit for Proficiency in the Theory and Practice of Buttermilking to Miss S. Beynon, Miss R. Phillips, L. Liventhal, Miss M. M. Davies, Miss J. A. Evans, Miss M. M. Jones, Miss M. E. Llewellyn, Miss W. M. Phillips, Miss E. Thomas, Miss A. Williams, Miss K. Williams, and Miss E. Griffiths.

EXAMINATION FOR BUTTERMILKING AND CHEESEMAKING, CERTIFICATES AT THE BRITISH DAIRY INSTITUTE, READING ON TUESDAY, WEDNESDAY, AND THURSDAY, JUNE 15TH, 16TH, AND 17TH.

- A Certificate of Merit for Proficiency in the Theory and Practice of Buttermilking and Cheesemaking to Miss Hannah J. Lewis, Miss Margaret E. Jenkins, and Miss Constance L. Butterworth.
- A Certificate of Merit for Proficiency in the Theory and Practice of Buttermilking to Miss Phyllis C. Collet, Miss Olive Fawcett, Miss Eileen Lambton, Miss Ursula J. Gregory, and Walter Rushton.
- A Certificate of Merit for Proficiency in the Theory and Practice of Cheesemaking to Miss Alice M. Moylan and Miss Kathleen M. Thornbery.

EXAMINATION FOR TEACHERS' BUTTERMILKING AND CHEESEMAKING CERTIFICATES AT THE COUNTY DAIRY SCHOOL, CHELMSFORD, ON MONDAY, TUESDAY, AND WEDNESDAY, JULY 19TH, 20TH, AND 21ST.

- A Teacher's Certificate for Proficiency in the Science and Practice of Dairying to Miss Hilda E. Ellingworth.
- A Certificate of Merit for Proficiency in the Theory and Practice of Buttermilking to Robert Morton, Leopold F. May, Miss Mary E. Poole, Miss Gwendolen A. Battcock, Miss Gladys J. Chapman, Herbert Wheeler, Miss Jean H. Craig, Miss Mabel Humphries, Charles E. Culley, Miss Ruth M. Nunn, and George E. C. Wedlake.

EXAMINATION FOR DIPLOMAS AND CERTIFICATES AT THE BRITISH DAIRY INSTITUTE, READING, ON TUESDAY, WEDNESDAY, AND THURSDAY, SEPTEMBER 21ST, 22ND, AND 23RD.

- A Diploma and Silver Medal for Proficiency in the Science and Practice of Dairying and Dairy Farming to Miss Constance L. Butterworth and Miss Alice M. Moylan.
- A Certificate of Merit for Proficiency in the Theory and Practice of Buttermilking and Cheesemaking to Miss Jessie H. Wallace.
- A Certificate of Merit for Proficiency in the Theory and Practice of Cheesemaking to Miss Sybil E. Cottrill and Miss Jessie M. Stuart.
- A Certificate of Merit for Proficiency in the Theory and Practice of Buttermilking to Miss Dorothy M. Malet, Miss Evelyn M. Smallbone, and Douglas A. Edwards.

British Dairy Farmers' Association.

MEDAL SCHEME.

Special Prizes at Educational Institutions and Country Shows.

The Council of the British Dairy Farmers' Association is prepared to consider applications from Educational Centres and Approved Societies in the United Kingdom for their Silver and Bronze Medals to be awarded in connection with dairying and dairy farming under the following conditions, viz. :—

1. All applications must be made on the official form and must clearly state the object for which the Medal or Medals are required.
2. Only one application from any Institution or Society can be considered in any one year.
3. The application must be repeated annually if Medals are again required.
4. A copy of the Proposed Prize List, showing the Conditions of the Award of the Medal and the name of the judge, should accompany the application, and the offer of a Medal cannot be confirmed until the Prize List has been approved.
5. The British Dairy Farmers' Association stipulates that no entry fee shall be charged in respect of these Medals, they being offered as *Special Extra Prizes*.
6. Notification of the award, with the winner's full name and address, to be forwarded to the Secretary, British Dairy Farmers' Association, 28, Russell Square, London, W.C., within 14 days of the award being made.
7. A person may not receive more than one Medal under this Scheme for the same subject or exhibit during any one year.

In the event of any dispute as to the interpretation of these Rules, the Council of the British Dairy Farmers' Association reserve full power of decision, and in the event of the Medal not being awarded in accordance with the above Rules and Conditions, the Council reserve the right to withhold the Medal altogether.

BY ORDER OF THE COUNCIL.

AWARDS DURING 1914-15.

| Name of Society. | Show or Examination held at | Date. | Medal. | Winner and Object. |
|--|-----------------------------|----------------|--------|--|
| University College of South Wales ... | Cardiff ... | Dec. 9 & 10... | Silver | Miss S. Beynon, for First Place in Junior Scholarship. |
| Cheshire Dairy Farmers' Association ... | Chester ... | Oct. 5 & 6 ... | " | J. Minshull, for Cheshire Cheese. |
| Gloucestershire Root, Fruit, and Grain Society | Gloucester ... | Nov. 9 | " | Colin MacIver, for Butter. |
| Whitchurch Dairy Farmers' Association ... | Whitchurch ... | " 23 & 24 | " | A. Willis, for Cheese. |
| " " " " | " " | " 23 & 24 | Bronze | Miss Simon, for Butter. |
| Lancashire Education Committee | Lancaster ... | Dec. 9-11 ... | Silver | Miss M. Astley, as winner of Dairy Diploma Examination. |
| Monmouthshire Agricultural Education Committee | Newport... .. | " 15 ... | " | W. J. Thomas, as best Student in Dairying and Dairy Farming Examination. |
| " " " | " " " | " 15 ... | Bronze | W. Beer, as second best Student in Dairying and Dairy Farming Examination. |

HALF-YEARLY REPORT OF THE COUNCIL TO THE MEMBERS, PRESENTED TO THE MEETING HELD AT THE DAIRY SHOW, OCTOBER 20th, 1915.

In presenting their Report to the Members at this the 40th Half-yearly Meeting, the Council has with much regret to announce a material depletion of its Membership, through consequences arising out of the War, and it is hoped that Members will make special efforts to induce their friends to join and thus make good the losses.

Among those of whom the Association has been deprived by death may be mentioned Lord Rothschild, who was a regular and very successful exhibitor at our Dairy Show; and Mr. J. B. Ellis, for many years a member of the Council, and a very regular attendant at the Annual Conferences, in connection with which his genial presence will be greatly missed.

The Dairy Conference, which was fixed to be held in Italy this year, was necessarily abandoned, and while the present state of affairs prevails it will be impossible to say where or when the next will take place.

The Medal Distribution Scheme still continues to be popular with Affiliated Societies and kindred Associations, although applications have not been so numerous owing to a number of Shows having been cancelled.

The Council has been honoured by Lord O'Hagan, whose interest in the Association is well known, allowing his name to be submitted for re-election as President for 1916, and your vote in support of the Council's re-nomination will shortly be asked.

The following list of Vice-Presidents has also been prepared, and you will be asked for your approval, viz. :—

The Marquis of Crewe, K.G.
 The Lord Northbourne.
 The Lord Kenyon.
 The Lord Strachie.
 Right Hon. Jesse Collings.
 Sir Mark J. McTaggart Stewart, Bart.
 Sir Gilbert Greenall, Bart., C.V.O.
 George Barbour, Esq., J.P.
 S. Palgrave Page, Esq., J.P.

In accordance with the Articles of Association the following Members of the Council retire by rotation, viz. :—

Mr. G. Titus Barham (Sudbury), Major E. W. Caddick (Ross), Mr. R. H. Evans (Pwllheli), Captain R. H. Howman (Swindon), Mr. John Lee (Ellesmere), Sir Sidney J. Pocock (Esher), Mr. B. Ravenscroft (Deal), Mr. J. L. Shirley (Bletchley), Mr. A. Tisdall

(Holland Park), Mr. L. C. Verrey (Oxshott), Mr. C. W. Walker-Tisdale (Northallerton), Mr. John Welford, J.P. (London).

All of the above, with the exception of Mr. G. Titus Barham, are seeking re-election, having been duly nominated, and Mr. Edward C. Ash, of Dallingham Hall, Wickham Market, being the only other Member nominated, no ballot was necessary, as there are consequently the exact number of nominations for the vacancies.

At the Annual General Meeting held on March 31st, the following Resolutions were carried by a large majority, after the attention of the Association had been drawn to the unfairness of the magistrates' decision in milk prosecutions against farmers, and the way in which they could be misled by incorrect analyses, viz. :—

“That in the opinion of this Meeting no prosecution for added water should be taken unless the casein, sugar, and ash have been determined separately and stated in the analyses.”

“That the Board of Agriculture be requested to again circularise Magistrates regarding the objects of the limits which have been fixed by the Board, and that where they are of opinion that the milk is natural, they should not convict.”

The following Resolution was also passed, viz. :—

“That the British Dairy Farmers' Association request the Local Government Board to consult their Council before making any orders under the Milk and Dairies Act, 1914.”

MAY 5TH.

The Council appointed a Committee to investigate the merits of various Milking Machines in the country, and voted a sum of £25 to defray expenses. The result of the investigation is not yet complete, only a preliminary report being to hand.

JUNE 9TH.

The following Resolutions were unanimously passed :—

- (1) “That Lord Strachie be requested to ask a question in the House of Lords regarding the wording of certificates given by Public Analysts under the Sale of Food and Drugs Act, more especially as regards samples of milk which fall below the limits of the Board of Agriculture; and to draw attention to the Certificate given in the case of Mr. Turner, Clay Hall Farm, Lavenham, where the milk was taken from a cow in the presence of an Inspector, yet the Analyst reported that the sample contained $5\frac{3}{4}$ per cent. of *added* water, in view of which the Magistrate, though not convicting, made the vendor pay costs.”
- (2) “That the whole of the facts in the case of a Mr. Turner, at Milford, in April last, be placed before the Home Secretary, and that a request be made for the costs in the case to be remitted.”

In response to the above, the Home Office replied that they had no power to remit costs, which lie within the discretion of the Justices.

A letter was read from the Cheshire Milk Producers' Association, quoting the decision arrived at in the Scotch Courts of Appeal in the case of *Scott v. Jack* (1912), and stating that, as it is a question that vitally affects the whole of the Dairy Farmers in England, all the agricultural organisations in the country should be invited to give their moral and material support to the movement, so as to secure—

- (a) Concerted action; and
- (b) To distribute the expense of carrying forward such an appeal case over the whole of those interested.

The Resolution referring to the case having previously received the approval of the British Dairy Farmers' Association, it was agreed:—

“That the British Dairy Farmers' Association do guarantee a sum of money not exceeding £50 for the purpose of supporting the Cheshire Milk Producers' Association as laid down in their letter of May 11th, 1915, provided that the total guarantee fund is not less than the sum of £1,000.

The following Resolution was also passed:—

“That the attention of the Board of Agriculture be drawn to the serious diminution of Live Stock in the United Kingdom, and to urge the Board to at once exercise its powers to prohibit the slaughter of calves unless certified not fit to rear. Such action will help to prevent a serious predicament as regards Live Stock and the milk supply at a later date.”

The above Resolution was followed by the Board issuing an order prohibiting the slaughter of calves, which contained several suggestions put forward by the Association.

Another Resolution was also passed, viz.:—

“That the coming into operation of the Milk and Dairies Act be postponed until the operation of the Tuberculosis Orders come into force.”

SEPTEMBER 15TH.

A letter dated August 7th was read from the Berks and adjoining Counties Dairy Farmers' Association (an affiliated Society to the British Dairy Farmers' Association), giving a statement of the facts in the case of *Rose v. the Great Western Railway Company*, and asking for financial support towards the funds to be used for the purpose of fighting the appeal. The Association voted a sum of £25 to be devoted to such guarantee fund.

It was only after consulting past Exhibitors as to their views *re* organising the Dairy Show under the adverse circumstances that

prevail and the financial loss which resulted last year that the Council decided to proceed on much the usual lines. That their action in proceeding is justified can be seen from the result so far achieved, and as shown by the comparative statement of entries for the past 12 years:—

| | 1904. | 1905. | 1906. | 1907. | 1908. | 1909. |
|--------------------------------------|-------|-------|-------|-------|-------|-------|
| Cattle | 164 | 182 | 210 | 237 | 247 | 232 |
| Milking and Butter Tests | 167 | 217 | 247 | 245 | 224 | 236 |
| Goats | 46 | 51 | 51 | 48 | 72 | 84 |
| Poultry | 2,678 | 3,068 | 3,347 | 3,081 | 3,280 | 2,997 |
| Pigeons | 2,426 | 2,440 | 2,573 | 2,664 | 2,564 | 2,282 |
| Poultry and Pigeon Appliances | — | — | 55 | 65 | 50 | 37 |
| British Cheese | 250 | 268 | 255 | 420 | 357 | 355 |
| Bacon and Hams | 46 | 49 | 39 | 57 | 76 | 55 |
| Butter | 556 | 641 | 578 | 593 | 668 | 535 |
| Cream | 44 | 52 | 42 | 35 | 47 | 42 |
| Skim-Milk Bread, &c. | 140 | 121 | 159 | 118 | 135 | 115 |
| Honey, &c. | 122 | 124 | 118 | 67 | 85 | 88 |
| Egg and Butter Packages | 20 | — | — | — | — | — |
| New and Improved Inventions | 43 | 22 | 17 | 33 | 37 | 31 |
| Vehicles for Conveying Milk | 25 | — | — | — | — | — |
| Roots | 184 | 170 | 156 | 177 | 181 | 218 |
| Butter-making Contests | 172 | 206 | 199 | 200 | 207 | 120 |
| Milkers' Contests | 55 | 66 | 121 | 135 | 132 | 126 |
| | 7,138 | 7,677 | 8,197 | 8,175 | 8,362 | 7,553 |

| | 1910. | 1911. | 1912. | 1913. | 1914. | 1915. |
|--------------------------------------|-------|-------|-------|-------|-------|-------|
| Cattle | 288 | 222 | 210 | 286 | 234 | 204 |
| Milking and Butter Tests | 264 | 213 | 209 | 265 | 167 | 198 |
| Goats | 75 | 81 | 105 | 110 | 85 | 116 |
| Poultry | 3,259 | 3,300 | 3,350 | 3,840 | 3,089 | 2,653 |
| Pigeons | 2,280 | 2,226 | 2,496 | 2,467 | 2,391 | 2,735 |
| Poultry and Pigeon Appliances | — | — | — | — | — | — |
| British Cheese | 362 | 249 | 343 | 395 | 301 | 271 |
| Bacon and Hams | 104 | 58 | 71 | 89 | 67 | 45 |
| Butter | 525 | 484 | 618 | 549 | 371 | 339 |
| Cream | 47 | 26 | 48 | 43 | 27 | 20 |
| Skim-Milk, Bread, &c. | 98 | 72 | 83 | 64 | 46 | 65 |
| Honey, &c. | 96 | 87 | 95 | 106 | 126 | 77 |
| Egg and Butter Packages | — | — | — | — | — | — |
| New and Improved Inventions | 34 | 21 | 25 | 41 | 24 | 6 |
| Vehicles for Conveying Milk | — | — | — | — | — | — |
| Roots | 196 | 172 | 190 | 190 | 59 | 51 |
| Butter-making Contests | 145 | 165 | 165 | 141 | 97 | 101 |
| Milkers' Contests | 122 | 153 | 119 | 137 | 85 | 82 |
| | 7,895 | 7,529 | 8,127 | 8,723 | 7,069 | 6,963 |

FORTIETH

ANNUAL REPORT OF THE COUNCIL

to the General Meeting of Members.

Wednesday, June 7th, 1916.

The Council is able to report that, notwithstanding the War, the work of the Association has been carried on with fairly successful results. At the close of 1914 there were 1,222 members, 53 have been elected since and 77 have resigned or died, leaving a total of 1,198 made up of 1,110 Annual, 84 Life, and 4 Honorary Members. There are 14 Kindred Societies affiliated with 14 delegates upon the Council.

Since the Half-yearly Meeting in October last, Mr. Primrose McConnell has been elected to fill the vacancy on the Council caused by the election of Mr. John Welford, J.P., to a Vice-Presidency, the other new Vice-President being Mr. G. Titus Barham.

The Financial Statement for the year ended December 31st, 1915, is attached hereto.

The Dairy Conference and Tour, which is one of the main features of the Association's activities was, owing to the War, abandoned, and it is proposed not to hold another until more settled conditions prevail.

The Fortieth Annual Dairy Show was again carried out with all its features intact, and that it was appreciated by the general public as a solace from War worries is shown by the takings in Admission money. The Council have in hand their revision of the Schedule

of Prizes for this year, and the Show, if held, will take place at the Royal Agricultural Hall on October 17th, 18th, 19th, and 20th.

Educational work is still carried out at the British Dairy Institute under the Management of a Joint Committee of the Association and the University College, Reading, and the success of the enterprise and the good tuition given there is reflected in the results of the Examinations in Dairying and Dairy Farming which have been held at different centres of instruction, four examinations taking place during the year for the Association's Diplomas and Certificates—two at the British Dairy Institute, one at the Essex County Dairy School, Chelmsford, and one at Cardiff for the University College of South Wales and Monmouthshire—the two latter at the request of the Education Committees represented. The following awards resulted, viz.:—

- 2 Diplomas for Proficiency in the Science and Practice of Dairy Farming and Dairying.
- 1 Teacher's Certificate for Proficiency in the Science and Practice of Dairying.
- 8 Certificates of Merit in the Theory and Practice of Cheese-making.
- 35 Certificates of Merit in the Theory and Practice of Butter-making.

On account of fewer shows being held during the year, applications from Kindred Societies and Educational Institutes for Medals under the Distribution Scheme were not so numerous as usual. The following grants being made:—

| | | | Silver. | Bronze. |
|---------------------|-----|-----|---------|---------|
| Dairy Cattle ... | ... | ... | 1 | 1 |
| Butter or Cream ... | ... | ... | 1 | 1 |
| Cheese ... | ... | ... | 2 | — |
| Buttermaking ... | ... | ... | 2 | — |
| Examinations ... | ... | ... | 2 | 1 |

Since the last Half-yearly Meeting, complaints have been received from several of the Members relative to the non-payment by the War Office of claims agreed, for damage to farms, and the following Resolution was passed :—

“That the Council of the British Dairy Farmers’ Association desires to call the attention of the War Office to complaints against delay in payment for damage done in Military operations, and that Lord Strachie be asked to bring forward the matter in the House of Lords.”

The Council are happy to report that owing to Lord Strachie’s efforts a number of the claims are being settled satisfactorily.

Newspaper paragraphs having been brought to the notice of the Association with regard to an article called “Soya Bean Milk,” the Council reiterated their resolution passed early last year :—

“That no substance should be sold as milk or under any adaptation of that name which is not the actual secretion of the mammary gland of a female.”

STATEMENT OF ASSETS AND LIABILITIES, December 31st, 1915.

| LIABILITIES. | £ | s. | d. | £ | s. | d. |
|--|-------|----|----|-------|----|---------------------|
| Sundry Creditors | 94 | 17 | 7 | | | |
| ON ACCOUNT OF DAIRY SHOW, 1915— | | | | | | |
| Sundry Creditors | 227 | 16 | 7 | | | |
| Conference Cash | 35 | 0 | 3 | | | |
| Less Balance at last Account | 19 | 3 | 9 | | | |
| Surplus of Assets over Liabilities— As at December 31st, 1914 | 3,961 | 9 | 8 | | | |
| Deduct—Excess of Expenditure over Income | 470 | 18 | 8 | | | |
| Bank Overdraft.. .. . | | | | 3,490 | 11 | 0 |
| | | | | 390 | 11 | 2 |
| | | | | | | <u>£4,219 12 10</u> |

| ASSETS. | £ | s. | d. | £ | s. | d. |
|--|-------|----|----|-----|----|---------------------|
| Investments at Cost :— | | | | | | |
| £1,000 L. & S.W. Railway 3 per cent. Debenture Stock | 1,046 | 14 | 8 | | | |
| £1,000 L. & N. W. Railway 3 per cent. Debenture Stock | 887 | 12 | 6 | | | |
| £1,000 Metropolitan Water Board “B” Stock | 907 | 13 | 0 | | | |
| £500 India 3 per cent. Stock | 377 | 11 | 0 | | | |
| Furniture | 218 | 15 | 1 | | | |
| Less 10 per cent. depreciation... .. . | 21 | 17 | 6 | | | |
| British Dairy Institute : Value of Ap- pliances transferred to Reading | | | | | | |
| Sundry Debtors | 31 | 19 | 7 | | | |
| ON ACCOUNT OF DAIRY SHOW, 1915— | | | | | | |
| Sales | 2 | 13 | 4 | | | |
| Catalogues and Advertisements... .. . | 53 | 11 | 10 | | | |
| Entry Fees | 340 | 7 | 0 | | | |
| Prize Fund | 43 | 14 | 0 | | | |
| Miscellaneous | 16 | 15 | 0 | | | |
| Admission Money | 120 | 7 | 6 | | | |
| Cash in hand | | | | 609 | 8 | 3 |
| | | | | 32 | 17 | 8 |
| | | | | | | <u>£4,219 12 10</u> |

REPORT OF THE AUDITORS TO THE MEMBERS OF THE BRITISH DAIRY FARMERS' ASSOCIATION.

We have audited the foregoing Income and Expenditure Account and Balance Sheet with the books and accounts of the Association. We have received all the information and explanations we have required. In our opinion such Balance Sheet is a full and fair Balance Sheet containing the particulars required by the Regulations of the Association, and properly drawn up so as to exhibit a true and correct view of the state of the Association's affairs according to the information and explanations we have received and as shown by the Books.

21, Ironmonger Lane, London, E.C.

| | | |
|----------------------|---|------------------------|
| HARRY DUNN, | } | Auditors. |
| C. E. LILLY, | | |
| FRED PITTS, | | |
| ANNAN, DEXTER & CO., | } | Chartered Accountants. |
| | | |

THE British Dairy Farmers' Association.

THE OBJECTS OF THE ASSOCIATION

are the improvement of

DAIRY STOCK AND DAIRY PRODUCE,

by encouraging the Breeding and Rearing of Stock for the special purpose of the Dairy; a larger and more general production of Butter, Cheese, and Eggs; the Erection of Improved Dairy Buildings, and the Invention of New or Improved Dairy Utensils, Machinery, Implements, and Scientific Appliances. The Association also stimulates the Breeding and Rearing of Poultry, &c. By means of Papers in the Society's *Journal* (published annually), Annual Conferences in different dairy districts, Lectures, and Discussions, and in other ways, efforts are continually being made to disseminate a more thorough knowledge of Dairy husbandry.

Prizes to the value of about £3,500 are annually offered for competition at the Dairy Show held at the Royal Agricultural Hall, Islington, London.

It is difficult to over-estimate the importance and need of greater attention being paid to the Dairy industry. It is admitted that by improved modes of managing Milk and its products, the wealth obtained from the Milch Cows of the country could be increased most materially. The Council, therefore, appeal to Agriculturists of all classes, and Dairy Farmers in particular, who, by becoming Members of the Association, will practically aid in developing its usefulness.

The advantages of Membership comprise:—

- 1.—A free pass to all the Society's Dairy Shows, available each day during the Exhibition, with the privilege of admitting free (by ticket) a friend on any one day.
- 2.—The privilege of participating at specially low charges in the Dairy Conferences at home or abroad, organised by the Association.
- 3.—The Exhibition of Live Stock, Dairy Produce, and Utensils, at a reduced scale of fees.
- 4.—A copy (free by post) of the *Journal* of the Association, published annually; price 1s. to non-members.
- 5.—Analyses by the Analytical and Consulting Chemist, at low fees, of samples of milk, cream, butter, cheese, feeding stuffs, water, soil, manures, &c., and advice on dairy matters connected with his Department.

- 6.—Professional advice and assistance at a reduced scale of charges, in any case of disease among the live stock of the farm.
- 7.—Examinations by the Consulting Pathological Bacteriologist, for particular pathogenic or disease-producing organisms.
- 8.—Investigations by the Consulting Dairy Bacteriologist into the cause of trouble or taints in dairy produce.
- 9.—In any case of apparent hardship in connection with the administration of the Model Milk Clauses, Members are recommended to at once send details of such case to the Secretary, who will submit the matter to the Committee appointed to deal with such matters, after which, advice and assistance will be given by the Association.

The Annual Subscription is £1, but Dairy Instructors and *bonâ fide* Tenant Farmers are admitted on payment of 10s. 6d. per annum. The latter sum entitles Dairy Instructors to all privileges, except the reduced fees for exhibition at the Shows. A *bonâ fide* Tenant Farmer is deemed to be one who rents the whole of the land in his occupation.

MEMBERS' VETERINARY PRIVILEGES.

Members of the Association who require professional assistance in any case of disease among their animals must apply direct to the Consulting Veterinary Surgeon, Mr. SIDNEY VILLAR, F.R.C.V.S., Amersham Common, Bucks, whose scale of charge is as follows:—

| | £ | s. | d. |
|--|---|----|----|
| Personal Consultation | 0 | 10 | 6 |
| Post-mortem Examination and Report | 0 | 10 | 6 |
| Consultation by Letter | 0 | 5 | 0 |
| Visit and Report, in case of an outbreak of disease, in addition to personal and travelling expenses, per day | 2 | 2 | 0 |

MEMBERS' BOTANICAL PRIVILEGES.

The Council have fixed the following rates of charge for the examination of Plants and Seeds for the *bonâ fide* and individual use and information of Members of the Association (not being Seedsmen), who are particularly requested to mention the kind of examination they require, and to quote its number in the subjoined Schedule.

| No. | £ | s. | d. |
|---|---|----|----|
| 1.—A Report on the purity, and amount of nature of foreign materials, of a sample of seed | 0 | 1 | 0 |
| 2.—A Report on the perfectness and germinating power of a sample of seed Nos. 1 and 2 together | 0 | 1 | 0 |
| 3.—Determination of the species of any weed or other plant, or of any epiphyte or vegetable parasite, with a report on its habits, and the means for its extermination or prevention | 0 | 1 | 0 |
| 4.—Report on any disease affecting farm crops | 0 | 1 | 0 |
| 5.—Determination of the species of a collection of natural grasses found in any district, with a report on their habits and pasture value ... | 0 | 4 | 0 |

| CHEESE. | | | | | | | £ | s. | d. |
|---|-----|-----|-----|-----|-----|-----|---|----|----|
| Estimation of Water, Fat, Casein, and Ash ... | ... | ... | ... | ... | ... | ... | 0 | 10 | 6 |
| Examination for Foreign Fats ... | ... | ... | ... | ... | ... | ... | 0 | 10 | 6 |
| RENNET. | | | | | | | | | |
| Examination of Strength ... | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| CAKES AND MEALS | | | | | | | | | |
| Estimation of Oil only ... | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| Estimation of Oil, Albuminoids, and Carbo-hydrates ... | ... | ... | ... | ... | ... | ... | 0 | 10 | 6 |
| GRASS, SILAGE, ROOTS, &c. | | | | | | | | | |
| Estimation of Oil, Albuminoids, and Carbo-hydrates, &c. .. | ... | ... | ... | ... | ... | ... | 1 | 1 | 0 |
| MANURES. | | | | | | | | | |
| Estimation of Phosphoric Acid ... | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| Estimation of Soluble and Insoluble Phosphoric Acid ... | ... | ... | ... | ... | ... | ... | 0 | 7 | 6 |
| Estimation of Nitrogen... .. | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| Estimation of Potash | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| SOIL. | | | | | | | | | |
| Estimation of Lime | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| Analysis and Report | ... | ... | ... | ... | ... | ... | 2 | 2 | 0 |
| WATER. | | | | | | | | | |
| Analysis for Drinking or Dairy Purposes | ... | ... | ... | ... | ... | ... | 1 | 1 | 0 |
| POISONS. | | | | | | | | | |
| Examination of a Substance for Mineral Poisons | ... | ... | ... | ... | ... | ... | 2 | 2 | 0 |
| Examination for Organic Poisons (Alkaloids, &c.) | ... | ... | ... | ... | ... | ... | 3 | 3 | 0 |
| CIDER AND FERMENTED DRINKS. | | | | | | | | | |
| Estimation of Alcohol | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| Estimation of Alcohol, Sugar, Acidity, &c. | ... | ... | ... | ... | ... | ... | 0 | 10 | 6 |
| PRESERVATIVES. | | | | | | | | | |
| Examining a Substance for Boracic Acid or Salicylic Acid, &c., for each Substance sought... .. | ... | ... | ... | ... | ... | ... | 0 | 2 | 6 |
| Estimation of the quantity of Boracic Acid | ... | ... | ... | ... | ... | ... | 0 | 10 | 6 |
| Analysis of a Preservative | ... | ... | ... | ... | ... | ... | 1 | 1 | 0 |
| COLOURING MATTER. | | | | | | | | | |
| Examination for Artificial Colouring | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| CONSULTATION | | | | | | | | | |
| For Letter in reply to Enquiry | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| For Personal Interview | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| For Special Consultation | ... | ... | ... | ... | ... | ... | 1 | 1 | 0 |
| NOTE.—The Consulting Chemist will be prepared to quote reduced terms to members requiring a number of analyses at frequent intervals. | | | | | | | | | |

Instructions for Taking Fair Samples for Analysis.

Dairy Produce.—Milk should be sent in a well-corked 8-oz. clear bottle. The milk should quite fill the bottle. Butter or cheese, about 8 ounces; the former in a gallipot well tied down.

Soils.—A block of soil about four or five inches square, and nine inches deep, should be sent in a strong box by rail.

Artificial Manures.—Take a handful of manure out of at least half a dozen bags, mix these rapidly and thoroughly, breaking down all lumps. Forward about a pound of the mixture in a tin box, and retain the remainder. Samples of manure should be sent immediately after the delivery of the bulk, and before settling the account. All manures should be bought subject to analysis.

Feeding Materials.—Feeding cakes, meals, or grains: about a pound should be sent in a bag or box. Grass and hay: a bundle of a few pounds weight. Silage: a six-inch cubic block, packed closely in a box to keep it compressed.

Waters.—A Winchester quart glass-stoppered bottle should be procured from a druggist, well washed out with the water, then completely filled, the stopper tied securely down, and the bottle packed in a box and sent by rail.

N.B.—In order to prevent disappointment, the Chemist requests that as far as possible, Members desiring to hold a personal consultation should make an appointment by letter. Between 12 and 3 are the hours most convenient. The fees for analyses of artificial manures and feeding stuffs are payable in advance, and only applicable to Members who are not commercially engaged in the manufacture or sale of the articles sent for analysis. All communications intended for the Analytical and Consulting Chemist must be addressed direct to Mr. F. J. LLOYD, F.C.S., 3, New Street, Bishopsgate, London, E.C.

MEMBERS' BACTERIOLOGICAL PRIVILEGES.

EXAMINATIONS BY DR. ANDREWES, Pathological Laboratory,
St. Bartholomew's Hospital, London, E.C.

MILK. £ s. d.

Cultural and experimental examination for a particular pathogenic
organism 2 2 0

PASTEURISED OR STERILISED MILK.

Cultural and experimental examination for a particular pathogenic
organism 1 1 0

CREAM, BUTTER, OR CHEESE.

Cultural and experimental examination for a particular pathogenic
organism 2 2 0

WATER.

Cultural and experimental examination for a particular pathogenic
organism 2 2 0

INVESTIGATIONS BY MR. F. J. LLOYD, F.C.S., 3, New Street,
Bishopsgate, London, E.C., INTO THE CAUSES OF TROUBLE
OR TAINTS IN MILK, CREAM, BUTTER, OR CHEESE.

| MILK. | £ | s. | d. |
|--|----|----|----|
| Microscopical and cultural examination for a particular organism ... | 2 | 2 | 0 |
| Experimental and cultural examination for a particular organism | 5 | 5 | 0 |
| | 10 | 10 | 0 |

CREAM, BUTTER, CHEESE.

| | | | |
|---|---|----|---|
| Microscopical examination ... | 0 | 10 | 6 |
| Microscopical and cultural examination... | 2 | 2 | 0 |

PASTEURISED OR STERILISED MILK.

| | | | |
|---|---|----|---|
| Microscopical examination for bacteria ... | 0 | 5 | 0 |
| Estimating number of bacteria present ... | 0 | 10 | 6 |
| Culture examination of bacteria present ... | 2 | 2 | 0 |

Directions for Sending Samples.

Samples of milk or water (one quart) and cream (half pint) should be forwarded in wide-mouthed stoppered bottles which have previously been thoroughly cleaned, and then rinsed several times with very hot, almost boiling, water.

Butter is best sent in a $\frac{1}{2}$ -lb. brick or roll, just as it was made up, wrapped in grease-proof paper, and packed in a box.

If the *Cheese* is small, send a whole one; otherwise forward a square block of not less than one pound and not a wedge-shaped piece. Wrap in grease-proof paper and pack in a box.

All samples should be sent by the speediest method possible. They ought not to arrive either on Saturday or Sunday.

Samples to be examined for disease-producing organisms should be forwarded to Dr. Andrewes, Pathological Laboratory, St. Bartholomew's Hospital, London, E.C. Members are requested to note that in the case of examination for the tubercle bacillus the method of animal inoculation, which experience has shown to be the only reliable one, will be alone used. It is impossible to carry out the process of sedimentation necessary for the detection of tubercle bacillus in milk which is received in a curdled condition. The report cannot be sent for a period of four to six weeks from the time the sample is received, but in the case of other pathogenic organisms the time required is much shorter. Samples to be examined for organisms producing taints in dairy produce should be forwarded to Mr. F. J. LLOYD, F.C.S., 3, New Street, Bishopsgate, London, E.C.

THE BRITISH DAIRY INSTITUTE, READING.

The British Dairy Institute was established at Aylesbury in 1888, by the British Dairy Farmers' Association, and several hundred Students were successfully trained there in different branches of dairy work. In order that Students might have an opportunity of combining with the practical study of dairying a more complete scientific instruction, the Institute was, in 1896, moved to Reading, and placed under the management of a Committee representing the British Dairy Farmers' Association and the University College, Reading.

The Institute contains large milk-receiving, butter-making, and milk-testing rooms; rooms for the manufacture of pressed, unpressed, and soft cheeses; and rooms for the ripening and drying of different varieties of cheese; besides reading, lecture, and common rooms. It is equipped with the best modern apparatus for the manufacture of dairy produce.

The instruction given is both practical and theoretical, and is arranged to suit the requirements of those who need either elementary or advanced dairy instruction, or who wish to perfect themselves in the manufacture of any special variety of dairy produce, including power-driven separating, pasteurizing, and butter-making plant, a steam turbine separator, and cold storage plant.

The Institute is open throughout the year, except during the Winter Vacation of eight weeks, which commences about the middle of November.

Students may join at any time and for any period.

The manufacture of hard-pressed cheeses extends from March to the end of September, but Stilton and other blue-veined varieties are not made until May.

Soft cheese making is taught during the whole of the time when the Institute is open.

During the winter months (October and November and January to March) instruction is given in buttermaking, clotted-cream making, the testing and analysis of milk, bacteriology, the management of various types of separators, the handling and care of milk, and the preparation of starters, &c. Lectures and demonstrations are usually given in the afternoons, the mornings being chiefly devoted to practical dairy work.

Practical and theoretical instruction in butter-making and cheese-making (including hard-pressed, blue-veined, and soft cheese), £1 per week; £10 for three months; £18 for six months.

Practical and theoretical instruction in buttermaking only, 10s. per week.

A full Prospectus will be sent on application to the Secretary, British Dairy Institute, Reading.

The British Dairy Farmers' Association.



LIST OF MEMBERS, MARCH, 1916.

- ABBOT, Richard (Abbot Bros.), Thuxton, Norfolk
 Abbot, Thomas, Wymondham, Norfolk
 Abbott, Edward (Abbott Bros.), Gun Lane, Limehouse, London, E.
 Abbott, Harold Ray, Grange Hill, Chigwell, Essex
 Adams, John, Broomhurst Farm, Fleet, Hants; and 7, Moreton Street, Pimlico London, S.W.
 Adamson, J., 21, Charterhouse Street, London, E.C.
 Ade, John, Grove Hill Farm, Hellingly, Sussex
 Adeane, C. R. W., Babraham, Cambridge (all communications to A. Eltringham)
 Alexander, Geo., The Barns, Old Church Road, Stepney, London, E.
 Alexander, Reuben C. Lawrence, Model Farm Dairy, Tidey Street, Devons Road, Bromley-by-Bow, London, E.
 Alexandra Separator Co. (represented by Harold V. Hunt), 9-11, Eagle Street, London, W.C.
 Alexander, W., Les Buttes, St. Mary's, Jersey
 Alexander, W. J., Sele Farm, Hertford
 Allsop, Hy., 89, Spencer Street, Birmingham, Warwickshire
 Andrew, A., Uplands, Hawkley, Liss, Hants
 Aplin, James Shorland (representing Aplin & Barrett), Yeovil, Somerset
 Appleton, Fife, The Bar House, Beverley, Yorks
 Archer, J., Hill Farm, Ash Priors, Bishops Lydeard, Somerset
 Arkwright, William, Sutton Scarsdale, Chesterfield, Derby
 Armitage, Ziba, J.P., Newton Bank, Preston Brook, Cheshire
 Arnold, Edwin Ross, The Cottage, Maidenhead, Berks
 Ash, Edward C., M.R.A.C., Dallinghoo Hall, Wickham Market, Suffolk
 Ashby, Joshua J., Brixton Flour Mills Brixton, London, S.W.
 Ashby, Skidmore, Rivernook Farm, Wraybury, Bucks
 Ashcroft, W., 13, The Waldrons, Croydon, Surrey
 Ashley, Mrs. E., Prospect House Farm, Irlam, Manchester, Lancs
 Assheton, R. C., Downham Hall, Clitheroe, Lancs (L.M.)
 Associated Manufacturers' Co. (represented by L. J. Martin), 72-80, Mansell Street, Aldgate, London, E.C.
 Astley, J. W., Southfield, West Marton, Skipton, Yorks
 Astor, Waldorf, M.P., Cliveden, Taplow, Bucks
 Atkinson, Mrs. A. E., Clint House, Clint, Hampsthwaite
 Atkinson, Mrs. K. M., Kirkbarrow, Tirril, Penrith, Cumberland
 Atkinson, Richard, 33, Heathfield Road, Wavertree, Liverpool, Lancs
 Atkinson, R. C., Upper Fulbrook, Stratford-on-Avon
 Attwater, J. A., Dry Leaze, Cirencester, Glos
 Austin, Robert, Inglestone, Twynholm
 Avis, A. A., Marlestone Stud Farm, Marlestone, Adelaide, South Australia (L.M.)
 Aylesbury Dairy Co. Ltd. (represented by I. A. Hattersley), 31, St. Petersburg Place, Bayswater, London, W.
 Ayre Brothers (represented by A. Lickiss), The Avenue, High Street, Hull, Yorks
 Ayre, R. S. V., Shepherd's Farm, Rickmansworth, Herts

- BABCOCK, Miss R. B., Bowls, Chigwell Row, Essex
 Bailey, Thomas L., Hartley Farm, Coulsdon, Surrey
 Baily, J., & Son, 116, Mount Street, W., and Heathfield, Mayfield, Sussex
 Baines, Clement, 121, Lower Addiscombe Road, Croydon, Surrey
 Baker, Benjamin Richard, 31, Barford Street, Islington, London, N.
 Baker, Granville, Hardwicke, Gloucester (L.M.)
 Baker, William Jas., Upper Hale, Farnham, Surrey
 Ballard, Fred, Colwall, Malvern, Worcs.
 Banwell, J. W., Home Farm, East Harptree, near Bristol, Glos
 Banyard, Richard, Nelves Farm, Romford, Essex
 Barbour, G., J.P., Bolesworth Castle, Chester
 Barclay, Edward Exton, Brent Pelham Hall, Buntingford, Herts
 Barham, Arthur S., Hole Park, Rolvenden, Kent
 Barham, G. Titus, Sudbury Park Farm, Sudbury, Harrow, Middlesex (L.M.)
 Barnard, W., Kelsey Manor Farm, Beckenham, Kent
 Barnes, Henry, 73, St. Helens Gardens, South Kensington, London, W.
 Barnston, Harry, M.P., Crewe Hill, Farndon, Cheshire
 Barr, Peter, Marston Park Farm, Amphilhill
 Barry, Lt.-Col. S. L., D.S.O., Pitsford Hall, Northampton
 Barrymore, Lord, Fota, County Cork
 Barton, J. E. R. Noel, West Royd, Kempsey, Worcester
 Bastard, William, Woodlands, Barkby, Leicester
 Bates, Oswald F., 10, Essex Street, Strand, London, W.C.
 Bates, Tom C., Sudbury Dairy Co., Sudbury, Derby
 Batho, Frank, Winston, Ellesmere, Salop
 Bathurst, Charles, M.P., Lydney Park, Gloucestershire
 Bedford, Frank, Dudswell Farm, Northchurch, Berkhamsted, Herts
 Bedford, Geo. Smith, University College, Reading
 Belgravia Dairy Co., Limited (represented by Fred. Pitts, Managing Director),
 2, Exhibition Road, South Kensington, S.W.
 Bell, Colonel, Guernsey (H.M.)
 Bell, John, Cattle Gate Farm, Enfield, Middlesex
 Belmont Stable Supply Co., Ltd. (represented by William Ellis), Experimental
 Farm, Llanidloes, Montgomeryshire
 Bennett, Alfred, Cote Farm, Aust, Tockington, Glos
 Benson, John, The Kettering Dairy, Dalkeith Place, Kettering, Northampton
 Bentall, E. E., Heybridge, Maldon, Essex
 Beron, J. Herbert, J.P., Englefield House, Reading, Berks
 Bere, Mrs. A. A., Stoodleigh Barton, near Tiverton, Devon
 Bernström, Herr John, Aktiebolaget Separator, Stockholm (H.M.)
 Berry, A., 22, Ballingdon Street, Sudbury, Suffolk
 Berry, Grosvenor, Bromley Hall, Standon, Herts
 Bertodano, Baldomero de, Cowbridge House, Malmesbury, Wilts
 Best, Miss Edith L., St. Andrew's Hall, Reading, Berks
 Bethell, Thomas P., Crown Works, Boundary Place, Liverpool, Lancs
 Betts, Walter, Moreton, Thame, Oxon
 Bewes, Charles, Gnaton Hall, Yealmpton, Devon
 Billson, Mrs. Emily M., The Priory, Martyr Worthy, near Winchester
 Birch, Alfred, Edge Farm, Sefton, via Seaforth, Liverpool
 Birmingham Dairy Co., Limited (represented by W. T. Harrison), Dalton Street,
 Birmingham, Warwickshire
 Blackburn, C., Head Street, Liverpool, Lancs
 Blackburn, George John, Oarside Dairy Farm, Liscard, Cheshire
 Blackstone, Edw. C. (Blackstone & Co., Ltd.), Rutland Iron Works, Stamford,
 Lincoln
 Blake, Fred, The Home Farm, Nightingale Road, Guildford, Surrey
 Bland, G. R., County Hall, Oxford
 Blickfeldt, Soren Hoy, Cross Deep, Osterley Park Road, Southall, Middlesex
 Blinman, Francis K., The Parsonage, Farrington Gurney, Bristol, Glos
 Blundell, Stanley, Bendish House, Welwyn, Herts

- Blunt, Miss M. S., The Midland Dairy College Kingston, Derby
 Blyth of Blythwood. Lord, Stansted, Essex
 Blyth, Wilson, Park Farm, St. Osyth, Essex
 Bocton, Edgar O., Leeming, Watermillock, Penrith
 Boelter, W. R., "The Smallholder," 18, Henrietta Street, Covent Garden, London, W.C.
 Boggild, Professor Bernhard, Frydendalsvej, 2 V., Copenhagen (I.I.M.)
 Bolitho, Thomas Robins, Trengwainton, Hea Moor, S.O., Cornwall (Agent: W. Cooper, Estate Office)
 Bolton, Herbert James, Waltham Cross, Hertfordshire
 Bourne, Walter Wm., Garston Manor, near Watford, Herts (L.M.)
 Bowden, J. Lancelevy Farm, Sherfield, Basingstoke
 Bradford, William Litler, Pendleton, Manchester, Lancs
 Bradish-Ellames, Mrs. A. G., Manor House, Little Marlow, Bucks
 Bradley, William McKenzie, Greenfields, Horley, Surrey
 Brake, Ernest, Mudford Sock, Yeovil, Somerset
 Brand, Admiral The Hon. T. S., Glynde, Lewes. (Agent, Thos. W. Pickard, Glynde, Estate Office, Lewes, Sussex)
 Brander, Miss Anna E. L. (L.M.)
 Brandon, Joseph, Horton Hall Farm, Leighton Buzzard
 Brandt, A. P., Castle Hill, Betchingley, Surrey
 Brassey, Capt. R. B., Cottesbrooke Hall, Northampton (L.M.)
 Bray, Miss Evelyn, County Education Office, The Castle, Exeter
 Brazier, Frederick G., Ley House, Grandborough, Winslow, Bucks
 Bridger, Richard, Durleigh Farm, Rogate, Sussex
 Bridges, John H., Ewell, Surrey (L.M.)
 Brigg, Thomas, High House, Addingham, near Ilkley, Yorks
 Briggs, Harold S., Arniesyde, St. Boswells, N.B.
 Brindley, Frank, The Peel Astbury, Congleton, Cheshire
 Bristol Wagon and Carriage Works Co., Ltd. (represented by G. Falconer Fry), Lawrence Hill, Bristol, Glos
 Britch, Edwin, Thorn Brow Farm, Appleton, Warrington, Lancs
 Brittain, Arthur, Horsemoor Farm, Woburn, Beds
 Brocklehurst, W. S., Grove House, Bedford
 Brocq, John Noble le, Broughton Lodge, St. Mary's, Jersey
 Brocq, Ph. le, La Chasse, St. Ouen's, Jersey
 Brodie, George Gordon, Woodlands, The Park, Cheltenham, Glos
 Brodie, W. A. G., Errogie House, Stratherrick, Inverness (L.M.)
 Bromet, John, Golf Links Farm, Tadcaster
 Brooke, Charles E., 206 and 207, Central Poultry Market, E.C. (L.M.)
 Broom, T. W., Sondes Place Farm, Dorking, Surrey
 Broome, Alfred, Windmill Farm, Preston Brook, near Warrington, Lancs
 Broomfield, John, 1, Clitheroe Road, Clapham, London, S.W.
 Broughall, E., Hindford, Whittington, Oswestry, Salop
 Brown, Mrs. Agnes, Hedges Farm, St. Albans, Herts
 Brown, A. E., Staplehurst Poultry Farm, Staplehurst, Kent
 Brown, Edward, 39, Queen Anne's Chambers, Broadway, Westminster, London, S.W.
 Brown Ellis, Quarry Moor, Ripon, Yorkshire
 Brown, E. J., Thornholme, Brigg, Lincs
 Brown, F. C., Barrow Hills, Longcross, Surrey
 Brown, G. B. M., Manor House, Heacham, near King's Lynn, Norfolk
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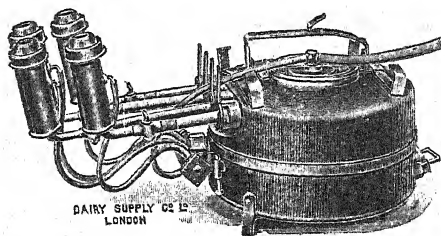
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The Development of the Dairy Industry.

THE INCREASE AND IMPROVEMENT OF DAIRY LIVE STOCK.

By JAMES MACKINTOSH, N.D.A., N.D.D., Lecturer and Adviser
in Dairy Farming, University College, Reading.

THE purpose of this paper is to consider the present position of the dairy live stock of this country, and how it may be increased in numbers and improved in quality and productivity.

It is desirable, by way of introduction, to give some facts which show beyond all doubt how necessary it is that not only dairy farmers, and those directly engaged in the dairy industry, but all interested in the future food supply of the nation, should give most careful attention to all possible means of increase and improvement.

Whether the present position is satisfactory or not may be judged by studying the answers to the following questions:—

1. Has the increase in numbers and productivity of dairy live stock in recent years been proportionate to the needs of the nation?
2. Does the number of live stock kept per unit of area and the productivity per animal compare satisfactorily with the figures for other countries?
3. What changes are most desirable in the interest of the nation as a whole?

1. COMPARISON WITH PREVIOUS YEARS.

The statistics published annually by the Board of Agriculture afford a means of comparison in all branches of farming, and, while it has been well known that in some respects (notably in the area of land devoted to arable cultivation) the position of the country was much inferior to that of 40 years ago, it was generally considered that the comparison was quite satisfactory as regards live stock. The number of horses and sheep had fluctuated slightly from year to year; pigs had increased slightly, and cattle—both “cows and heifers” and “other cattle”—showed a considerable increase. The general opinion amongst farmers was that the increase in the live stock, and the consequent greater production of beef and milk, practically made up for the decrease in grain production, and, as the home and foreign demand for high-class animals led to increased prices being realised year by year, it was felt that in quality of stock as well as in numbers Britain was easily maintaining its position. The following figures show the proportionate increases in cattle and pigs during the period 1876-1914:—

¹ Figures for cattle taken from the Supplement (No. 16) to the Journal of the Board of Agriculture, September, 1916, p. 7. Figures for pigs calculated from the Agricultural Statistics, 1914, issued by the Board of Agriculture.

TABLE I.
INCREASE IN CATTLE AND PIGS IN ENGLAND AND WALES.
Five-Year Averages (1876-1880 = 100).

| Average for the Years, | Cows and Heifers, | Other Cattle, | Pigs, |
|------------------------|-------------------|---------------|-------|
| 1876-1880 | 100 | 100 | 100 |
| 1881-1885 | 106 | 106 | 107 |
| 1886-1890 | 113 | 110 | 108 |
| 1891-1895 | 116 | 115 | 110 |
| 1896-1900 | 117 | 114 | 112 |
| 1901-1905 | 119 | 117 | 110 |
| 1906-1910 | 127 | 121 | 111 |
| 1911-1914 | 129 | 121 | 114 |

It will be noticed that "cows and heifers" show the greatest increase, but "other cattle" kept pace with the increase in cows up till 10 years ago. Since 1906 the rate of increase of cows and heifers has been greater.

It is exceedingly difficult to get any reliable comparison of the milk yield of cows throughout the above period. It is only recently that accurate records of yield have been obtainable to any extent, and even yet any statement of an average for a breed or for the country can only be an estimate. The increase in the number of dairy cows does not necessarily mean that the average yield is increased, although better methods of feeding and greater attention to selection and breeding have brought about much improvement in many herds during the last 10 years. Gavin, in a recent article², assumes the average yield per cow to be 450 gallons per annum.

The other important point which requires attention in this comparison is the relation between the increase in live stock and the increase in the population. Table II gives figures on the latter point from 1871-1911 :—

TABLE II.³
INCREASE IN POPULATION—ENGLAND AND WALES.

| Year. | Population. | 1871 = 100. |
|--------------|-------------|-------------|
| 1871 | 22,712,266 | 100 |
| 1881 | 25,974,439 | 114 |
| 1891 | 29,002,525 | 128 |
| 1901 | 32,527,843 | 143 |
| 1911 | 36,075,269 | 159 |

² "Some Aspects of the Dairying Industry of England and Wales," Supplement (No. 16) to Journal of the Board of Agriculture, September, 1916, p. 37.

³ *Ibid.*, p. 7.

A study of the total numbers of cows and heifers in relation to population shows that in 1911 there were only 69·2 cows and heifers in milk or in calf per 1,000 persons, as contrasted with 83·8 in 1870. It is evident, therefore, that the increase in the number of dairy stock has not been in proportion to the increase of the population.

2. COMPARISON WITH OTHER COUNTRIES.

Again, the statistics published by the Board of Agriculture afford some means of comparison with other countries, but it is very improbable that farmers study these annual reports in order to find out the comparative position of Britain. Such comparisons as have appeared in the Agricultural Press have dealt chiefly with the yields of crops *per acre*, and as the figures have usually shown Britain about the top of the list, the general result was to confirm the farmer in his opinion that British farming was supreme.

It required the upheaval of a great European War, and the consequent intense realisation of the insufficiency of the supply of home-grown foods to maintain the people of this country, to bring out the comparison of British farming with that of another country as regards *food production per 100 acres* instead of merely *yields per acre*, or *total numbers of stock*. The result of this comparison has been as surprising as it was unexpected, and a severe shock has been administered to the complacency of the British agriculturist.

COMPARISON WITH GERMANY.

The report⁴ on the recent development of German agriculture, prepared by Mr. T. H. Middleton and issued by the Board of Agriculture, presents in concise form a comparison of British and German methods and results which should be carefully studied by all farmers. From the live stock point of view, the following tables are of supreme interest:—

TABLE III.

NUMBER OF HORSES, CATTLE, SHEEP, PIGS, AND GOATS KEPT PER 100 ACRES OF CULTIVATED LAND IN GREAT BRITAIN AND IN GERMANY.

| | GREAT BRITAIN. ⁵ (31,900,000 acres.) 1914. | | GERMANY. ⁶ (82,274,000 acres) 1913. | |
|----------------|--|-----------------------|---|-----------------------|
| | Total No. of Animals. | No. per 100 Acres. | Total No. of Animals. | No. per 100 Acres. |
| Horses | 1,296,188 | 4·0 | 4,516,300 | 5·5 |
| Cattle | 7,092,918 | 22·2 | 20,153,700 | 24·5 |
| Sheep | 24,285,514 | 76·1 | 5,787,800 | 7·0 |
| Pigs | 2,634,249 | 8·3 | 21,885,100 | 26·6 |
| Goats | (?) | — | 3,384,000 | 4·1 |

⁴ "The Recent Development of German Agriculture," by T. H. Middleton, C.B.

⁵ Calculated from Agricultural Statistics, 1914, issued by the Board of Agriculture.

⁶ "The Recent Development of German Agriculture," p. 15.

TABLE IV.⁷

PRODUCTION OF MEAT (INCLUDING EGGS) AND MILK PER 100 ACRES OF CULTIVATED LAND IN GREAT BRITAIN (1908) AND IN GERMANY (AVERAGE OF 1912-1913).

| | GREAT BRITAIN. (32,211,386 Acres.) 1908. | | GERMANY. (82,274,000 Acres.) 1913. | |
|------------------------|---|---------------------------------|---------------------------------------|---------------------------------|
| | Home Production. | Production per 100 Acres. | Home Production. | Production Per 100 Acres. |
| | Tons. | Tons. | Tons. | Tons. |
| Beef | 474,650 | 1.49 | 1,058,700 | 1.29 |
| Mutton | 260,950 | .82 | 77,260 | .09 |
| Pork, Hams & Bacon ... | 315,550 | .99 | 1,994,300 | 2.42 |
| Other Butcher Meat ... | 100,000 | .31 | — | — |
| Poultry and Eggs ... | 114,000 | .36 | 383,000 | .47 |
| Total Meat | 1,265,150 | 3.97 | 3,513,260 | 4.27 |
| Milk | 5,555,000 | 17.4 | 23,160,000 | 28.1 |

Table III shows that the chief differences in the numbers of stock in the two countries are the small number of sheep and the large number of pigs kept in Germany. These differences have undoubtedly a great influence on the amount of meat produced, as the pig is a much more economical source of food than the sheep. (See page 11.)

The most important figures in these tables, however, for the purpose of this article, are those showing the relative numbers of cattle (and to a less extent those of pigs), and the production of beef and milk. It appears that Germany maintains slightly more cattle per 100 acres of cultivated land than Great Britain (24.5 as against 22.2), that in beef production we are slightly ahead (1.49 tons as against 1.29 tons), but that in milk production we are very much behind (17.4 tons as against 28.1 tons).

To the average British farmer, with his confidence in live stock as the sheet anchor of the country's agriculture, these statements come as an unpleasant surprise, yet Mr. Middleton in his comments on them goes on to say that they rather over-state the case for the British farmer. When the amounts of imported feeding stuffs used in the two countries are compared, it is found that the British farmer purchases annually about 11.5 tons per 100 acres, whereas the German farmer purchases 8.7 tons. The British farmer thus has the advantage of 2.8 tons of imported feeding stuffs per 100 acres, and, in addition, a certain amount of beef, and a considerable proportion of mutton is produced on mountain land not classed as "cultivated"; the average British 100-acre farm would have about forty acres of hill grazing, whereas the German farm would have about three acres⁸.

⁷ "The Recent Development of German Agriculture," p. 10.

⁸ *Ibid.*, p. 11.

Reference has been made to the prevalent opinion amongst farmers that the decrease in the arable land in Great Britain was balanced, as far as the food supply of the country was concerned, by the increase in live stock, and on this basis one would expect to find that, as Germany produces more meat, and much more milk per 100 acres than Great Britain, there would be at least as large a proportion of pasture and meadow land in Germany.

A comparison of the cropping of cultivated land in England and Wales, with that of Germany does not realise this expectation. Instead, the proportion of pasture land is very much less than in England; the average German 100-acre farm has 32 acres under grass and clover, the average English farm has 69 acres. This smaller proportion of pasture, and consequently greater proportion of arable, apparently enables the Germans to produce, per 100 acres of cultivated land, not only as much meat and nearly twice as much milk as we do, but, in addition, to produce 33 tons corn for every 15 tons grown in Britain, and 55 tons potatoes for every 11 tons produced in this country^a. It is clearly evident, therefore, that a high production of beef and milk is not necessarily associated with a low production of grain, &c. The increase of pasture in Britain has undoubtedly resulted in a serious decrease in the total amount of home-produced food.

EXPLANATION OF GREATER MILK PRODUCTION IN GERMANY.

The greater milk production per 100 acres in Germany may be due to the maintaining of a larger number of cows, or to the obtaining of a higher average yield of milk, or to a combination of both these factors. In order to determine which of these is the more important, an analysis of the numbers of cattle per 100 acres in Britain and Germany is given below :—

TABLE V.
ANALYSIS OF CATTLE PER 100 ACRES.
GREAT BRITAIN. (1914).

| Total Cattle. | Cows and Heifers in Milk and Cows in Calf. | Heifers in Calf. | Other Cattle. |
|---------------|--|---------------------|----------------|
| 22.2 | 8.1 (= 36.5%) | 1.1 (= 5.0%) | 13.0 (= 58.5%) |

BEEF PRODUCTION = 1.49 tons per 100 acres.

MILK PRODUCTION = 17.40 " "

GERMANY. (1913.)

| Total Cattle. | Cows. | Other Cattle. |
|---------------|----------------|----------------|
| 24.5 | 12.7 (= 51.8%) | 11.8 (= 48.2%) |

BEEF PRODUCTION = 1.29 tons per 100 acres.

MILK PRODUCTION = 28.16 " "

^a "The Recent Development of German Agriculture," p. 6.

The above table shows that in Britain the number of "other cattle" per 100 acres is slightly greater than in Germany, the figures being in much the same ratio as those for beef production, but it must not be assumed that the "other cattle" are the sole source of the beef supply. As regards cows in milk, Germany maintains 12·7 per 100 acres as contrasted with 8·1 per 100 acres in Britain, and this difference largely accounts for the greater proportionate milk production in Germany.

At the same time, there is evidence that the German cows are, on an average, slightly better milkers than the British; thus, if the total weight of milk produced per 100 acres be divided by the number of cows kept, the average yield appears as follows:—

BRITAIN.—17·40 tons produced by 8·10 cows, therefore
2·15 tons produced by 1 cow = 467 gallons¹⁰.
GERMANY. 28·10 tons produced by 12·7 cows, therefore
2·21 tons produced by 1 cow = 481 gallons.

The balance in favour of the German cow is but small, and in the absence of figures showing the relative numbers of cows of beef breeds (kept primarily for calf rearing), and of cows of dual purpose and dairy breeds (kept primarily for milk production), it is impossible to make a more accurate comparison.

It is clear, however, that the greater production of milk in Germany is due primarily to the larger number of cows kept per 100 acres, and to a much less extent, if at all, to a higher annual production per cow.

COMPARISON WITH OTHER EUROPEAN COUNTRIES.

If the numbers of the various kinds of stock in the other countries of North-Western Europe be compared with those of Great Britain and Germany, a better idea is obtained as to what can be done in the way of maintaining stock per 100 acres.

The following table is most enlightening¹¹:—

TABLE VI.
NUMBERS OF COWS, OTHER CATTLE, PIGS AND SHEEP PER 100 ACRES OF CULTIVATED LAND IN OTHER COUNTRIES.

| Country. | Total Cattle. | Cows. | Other Cattle. | Pigs. | Sheep. |
|-----------------------------|---------------|--------------|---------------|-------|----------------------------|
| Belgium (1909) | 42·6 | 21·0 | 21·6 | 25·5 | Not enumerated since 1895. |
| Holland (1910) | 38·0 | 20·0 | 18·0 | 23·6 | 16·7 |
| Denmark (1910) | 32·5 | 18·5 | 14·0 | 21·2 | 10·5 |
| Germany (1913) | 24·5 | 12·7 | 11·8 | 26·6 | 7·0 |
| Sweden (1910) | 22·4 | 15·2 | 7·2 | 7·8 | 8·2 |
| Great Britain (1914) | 22·2 | { 8·1 1·1 | 13·0 | 8·3 | 76·1 |
| France (1910) | 16·1 | 8·4 | 7·7 | 7·6 | 18·0 |

¹⁰ One gallon of milk weighs 10·3 lbs. One ton of milk has a volume of 217½ gallons.

¹¹ Calculated chiefly from the *Agricultural Statistics, 1911*, issued by the Board of Agriculture.

Great Britain is sixth in the above table as regards numbers of cattle per 100 acres of cultivated land; a bad fifth as regards pigs, and an easy first as regards sheep.

Much could be written in explanation and interpretation of the above figures. The value of the sheep in British farming in the past is indisputable; whether it ought to occupy as prominent a position in the future is a problem which must be seriously considered, but the necessity for an increase in cattle and pigs is self-evident.

3. REQUIREMENTS OF THE NATION.

One result of the war has been to bring home to everyone the fact that our dependence on imported foods is a serious national weakness. Should our Navy fail there is a possibility of starvation, rapidly followed by defeat. Even with a successful Navy, the decrease in supplies, the high freights, and the consequent high prices might easily lead to serious internal discontent and diminished national efficiency, while the necessity for paying large sums to foreign producers for imported food materially reduces the national credit.

Previous to 1914, the nation worked on the assumption that it was better to develop our trade and to import the bulk of our food, rather than to develop agriculture at home, but the war itself, and the realisation that we must never again run such risks, has made it clear that in the future we must greatly increase our home production, and decrease our imports—particularly those from outside the Empire—as much as possible.

The total amount and value of the dairy products imported into the United Kingdom has risen steadily for the last fifty years, reaching a total value of over £37,000,000 in 1913¹². Of this immense sum over £27,000,000 was paid to foreign countries, chiefly to Denmark and Russia for butter, and to Holland for margarine, cheese and condensed milk, while the balance was paid to our own Colonies, primarily to Australia and New Zealand for butter, and to Canada and New Zealand for cheese.

Rew, in a recent article,¹³ estimates that as regards butter and cheese, the home requirements of the United Kingdom are met from the following sources:—Butter (including margarine), home production—21·5 per cent.; British possessions—13·3 per cent.; Foreign countries—61·6 per cent. Cheese, home production—19·5 per cent.; British possessions—65·4 per cent.; Foreign countries—15·1 per cent. These statistics show that the home supply is not nearly equal to the constantly increasing demands of the home market, and it is a very evident national requirement that the home production of milk—the source of all dairy produce—should be greatly increased.

From three different points of view, therefore—from a review of the increase in numbers and productivity of our dairy stock, and the increase in our population; from a comparison of the food production per unit of area in this country with that of other countries; from a study of the present and future needs of the nation—the

¹² See *Agricultural Statistics, 1913. (Part IV.)*

¹³ See *Journal of the Board of Agriculture, September, 1915, page 514.*

necessity for increasing the production of milk is clearly shown, and the methods of increase demand the attention not only of those interested in the Dairy industry, but of the whole nation.

METHODS BY WHICH MILK PRODUCTION CAN BE INCREASED.

Preliminary considerations.

The first step towards any material increase in the production of milk must be the investment of a large amount of new capital in dairy farms, live stock, and other equipment, but before the possessors of such capital, whether farmers or others, can be expected to invest in this way, it is absolutely necessary that they must be reasonably certain that it will bring in a profitable return, and that there will be a sufficient supply of labour to undertake the extra work. If satisfactory prices can be assured for milk and other dairy products, and sufficient labour is available, an increase in the number of farms devoted to milk production, and in the total number of dairy stock kept, with a consequent increase in the total output of milk, will soon follow, but without security on these points it is unreasonable to ask for, or to advise, any such increase.

In this branch of agriculture, as in others, progress in the future in the direction which will be of most advantage to the nation can only be obtained if the changes involved are to the personal advantage of all connected with the land. The present unsatisfactory condition has arisen largely because in the past, the individual farmer, in order to gain his own livelihood, had to adopt methods which were not to the national advantage, and no real and lasting improvement can take place until the systems of farming and conditions of rural life, which are to the good of the nation shall also be to the benefit of the individual.

Further discussion on this aspect of the increase of dairy stock is not desirable here, but it must be generally recognised that no such increase will take place unless there is a reasonable expectation of a satisfactory interest on capital expended, and a sufficient supply of labour. These two points are of fundamental importance.

If we may assume that the two points just mentioned will be settled satisfactorily, then there are two methods by which the milk production of this country can be increased.

1. By increasing the numbers of dairy stock.
2. By improving the milk-producing powers of the cows.

Both of these methods can be employed in the same place and at the same time.

1. INCREASE IN NUMBERS OF STOCK.

We have seen that the chief cause of the greater milk production in Germany is the larger number of cows kept, and there is no doubt that it is only by increase in numbers that a really material increase in the production of milk, and thereafter of other dairy products, can be brought about.

SHOULD DAIRY STOCK REPLACE OTHER STOCK?

The first point to consider is whether the increase in numbers should be brought about by substituting dairy stock for other classes

of animals, or by increasing the dairy stock, while maintaining or even increasing the numbers of other classes.

The first alternative involves primarily the utilisation of certain crops by dairy breeds of cattle instead of by beef breeds and sheep, while the second obviously requires an increase in the total amount of food produced (increased importation of foods is not desirable) corresponding to the increase in numbers of stock.

The second alternative is certainly to be preferred, as it would give the greater total increase in human food, but there are points involved in the first alternative which merit careful attention.

In this country little thought has been given to the relative economy of the different farm animals in converting field crops into human food; the remarkable variations which do occur have been mentioned in the lecture room of the agricultural chemist, but the writer has never heard the subject discussed by the farmer or by those who take upon themselves to advise on national food production.

Lawes and Gilbert many years ago pointed out that the pig required only half the food of the steer to make the same increase in live weight¹⁴, and that a cow yielding 30 lbs. milk daily produced fully 26 lbs. digestible dry matter per week, whereas a steer making a weekly increase in live weight of 15 lbs., produced but 11 lbs. digestible dry matter; moreover, the weekly returns from the cow contained more than six times as much albuminoids (flesh-forming constituents) as the weekly returns from the steer¹⁵.

A better idea of the relative economy of the various farm animals is obtained by comparing the amount of food suitable for man yielded by each animal from 100 lbs. of digestible nutrients consumed.

The following table, and the accompanying notes, reproduced from Henry and Morrison's "Feeds and Feeding"¹⁶, are most instructive:—

TABLE VII.

HUMAN FOOD PRODUCED BY FARM ANIMALS FROM 100 LBS. OF DIGESTIBLE NUTRIENTS CONSUMED.

| Animal. | Marketable Product. | Edible Solids. | Animal. | Marketable Product. | Edible Solids. |
|--------------------|---------------------|--------------------|-------------------|---------------------|----------------|
| | lbs. | lbs. | | lbs. | lbs. |
| Cow (milk) ... | 139.0 | 18.0 ¹⁷ | Poultry (eggs) | 19.6 | 5.1 |
| Pig (dressed) ... | 25.0 | 15.6 | Poultry (dressed) | 15.6 | 4.2 |
| Cow (cheese) ... | 14.8 | 9.4 | Lambs (dressed) | 9.6 | 3.2 |
| Calf (dressed) ... | 36.5 | 8.1 | Steer (dressed) | 8.3 | 2.8 |
| Cow (butter) ... | 6.4 | 5.4 | Sheep (dressed) | 7.0 | 2.6 |

¹⁴ Warington's "Chemistry of the Farm," p. 194.

¹⁵ Journal of the Royal Agricultural Society, 1895.

¹⁶ "Feeds and Feeding" (1915 edition), pp. 90, 91.

¹⁷ For average English milk 17½ lbs. would be a more correct figure.

"The table, which presents one side of a most complicated problem, shows that for 100 lbs. of digestible nutrients consumed, the cow yields 139 lbs. of milk, containing 18 lbs. of solids"; practically all digestible. The pig produces about 25 lbs. dressed carcase; allowing for water, bone, and gristle, there remain over 15 lbs. of edible dry meat. The steer and the sheep yield less than 10 lbs dressed carcase, nearly half of which is water; deducting this, and the bone and gristle, there remains only from 2.6 to 3.2 lbs. of water-free edible meat.

"The cow easily leads all farm animals in her power to convert the crops of the field into human food, with the pig second, poultry following, and the steer and the sheep coming lowest."

Much might be written in qualification of the yields of products from the various animals as given above, and on other aspects of the utility of the different kinds of stock, and it is to be hoped that the whole subject will be thoroughly discussed from every point of view. Nevertheless, the results stated are strong arguments in favour of a replacement of beef cattle and sheep by dairy cattle where the soil and other conditions make this possible. (The subject of pigs will be dealt with later.) On grass land near large centres of population, it is especially desirable that such replacement should take place, so as to reduce the quantity of milk carried long distances by rail, and to make the most economical use of land, which, by its position has an exceptional value.

Where the increase in dairy stock takes place without displacement of other stock it is essential that more food must be available. This food must either be grown in this country or imported from abroad. Reasons have been given for the reduction of the amount of imported foods to the greatest possible extent, and it is therefore necessary that this extra supply of food be grown at home. The subject of increased crop production in relation to the development of the dairy industry is being dealt with by another writer, hence all that need be said here is to emphasise the absolute dependence of an increase in our dairy stock on an increase in our supply of home grown food.

WHICH BREEDS SHOULD BE INCREASED ?

It is also necessary to consider the purposes for which any increase in the supply of milk will be utilised, so that those breeds of dairy stock yielding the milk most suitable for these purposes may be the first to be increased in numbers. There is little doubt that the milk will be utilised chiefly for human consumption or for cheese-making—the relative importance of these two methods of utilisation varying according to the district; also in some localities an increased supply may be taken up by margarine or condensed milk factories, or for the manufacture of some special milk product, but it is safe to say that only a very small proportion of the increase will be utilised for butter-making. The sale of new milk or the manufacture of cheese are both much more profitable methods of utilisation than the manufacture of butter.

It follows, therefore, that the increase in stock should be chiefly in those breeds yielding milk most suitable for human consumption and for cheese-making, that is, the Dairy Shorthorn, Holstein-Friesian, Ayrshire, and such other local breeds as can hold their own against these better-known breeds in economy of production. There is little

need for an increase in the numbers of Jerseys and Guernseys in the herds of the commercial dairy farmer, although where butter is required for local or private consumption these breeds are superior to all others. The national utility of the various dairy breeds for milk production requires careful study in the future. (See also pages 25 and 26.)

OTHER POINTS IN RELATION TO INCREASE IN NUMBERS.

Whether the increase in numbers takes place by substitution or by addition, other points which will require attention will be the provision of adequate housing for calves and young stock as well as for cows, the introduction of the most improved types of labour-saving machinery and the relative economy of dairy farms of different sizes.

It is not too much to say that any material increase in the stock of cows on many farms must be associated with a re-construction of the cow-sheds, and, while milking machines may help to solve the problem of labour for milking, the preparation of the food, feeding and removal of manure will still have to be done. It is in these matters that the position, arrangement, and construction of cowsheds, etc., and the introduction of rail trolleys or over-head carriers on the American system, for conveyance of food and manure will play an important part in reducing the staff required.

The larger the herd, the greater the benefit to be derived from properly constructed and equipped buildings, and one development to be looked for in the future is the establishment of a greater number of large herds managed on the most up-to-date lines. Many small herds are not economical units, and this aspect of farm management must receive much more attention in the future from the farmers themselves.

2. IMPROVEMENT OF MILK-PRODUCING POWERS.

It is not possible to discuss this subject for any length of time before arriving at the difficult question as to whether dairy farmers should keep dual-purpose cows, or cows of purely dairy type, but it will be of more immediate benefit to discuss first the means of improvement which lie at the hands of all dairy farmers, and to defer a consideration of the dual-purpose *versus* dairy type to a later page.

The immediate and direct methods of improving the milk-producing powers of cows may be discussed under the heads (a) Feeding, (b) Selection, and (c) Breeding. These heads are not placed in order of importance, but rather in order of application. Cows are fed daily, and the system of feeding may be revised at any time. Purchases are made at intervals of days or weeks, and thus opportunities of selection are not so abundant; while a bull has to be purchased once in two or three years. It is most probable that the order of importance is exactly the reverse of the order of application.

(A) FEEDING.—Cows should be fed according to a definite system which takes account of the needs of the cow at different periods of the year. Dry cows should be fed so that they will be in fresh condition (but not too fat) at calving time. It has been definitely proved that cows in good condition yield more milk, with a higher percentage of

fat, during the three or four months succeeding calving, than they would do if they calved down in poor condition; also many farmers, who keep no record of the dates when their cows are due to calve, or who consider anything good enough for a dry cow, lose an appreciable amount of milk annually by their carelessness, and in addition, subject the cow's constitution to a strain for which it has not been properly prepared. Unless a cow at calving time has a reserve of flesh and fat to fall back on during the next three months, she cannot be expected to do herself justice.

In the feeding of cows in milk, the daily ration should be looked on as consisting of two parts:—(a) the "maintenance" part required simply for the upkeep of the animal body, and (b) the "production" part required for the manufacture of milk or any increase in live weight, and the latter part should vary in amount according to the quantity of milk produced. The practice of feeding all cows alike has been discarded by all progressive farmers, and but little thought should be necessary to show that such a method constitutes under-feeding for the heavy milker and over-feeding for the poor milker. The writer has heard it said, in excuse of this bad system, that though the heavy milker lost flesh rapidly for a time she made it up later and was in quite good order when dry. There is little hope for progress where such confused thinking exists.

There is also great room for improvement in the formation of rations. Much has been done in recent years by the issue of advisory bulletins and through the agricultural Press to give farmers information on the selection of rations for milk production, but large numbers still feed according to old custom and hearsay, and have no conception of what is meant by a "balanced ration," or why it is better than an unbalanced one. Some districts have naturally large supplies of certain home-grown foods, and these foods are fed in wasteful quantities, while the attempts to balance the ration by purchased foods are based on guess-work, and a study of advertisements. Every farmer should know exactly the quantities of roots, fodder, cake, and meals that his cows are getting daily. In illustration of the financial benefit which follows attention to detail in this matter, the writer recently published figures showing a total saving of £628 in feeding on four farms over eight winter periods, equal to £78 10s. per farm per winter¹⁸.

While a direct increase in quantity of milk produced and in economy of production is to be obtained by following the best methods of feeding cows, an indirect increase will also follow from improved methods of feeding and management of calves and young stock. Many calf-rearing experiments have been carried out in recent years, and the results have been useful in directing the attention of farmers to good mixtures of meals and other foods; the more recent trials with dry meals and water as a milk-substitute for calves after the age of six weeks are also valuable because of the simple and easy method of preparation and feeding, as contrasted with the labour and care

¹⁸ Report on Cost of Food in the Production of Milk in Berks and Bucks; Bulletin XXVII, University College, Reading, pp. 86, 87.

involved in the making of gruels. One point in calf-rearing which does not receive enough attention, however, is that of ensuring an equal distribution of the food, whether liquid or dry. Calves, even more than cows, require individual attention at feeding time, and this extra care is amply repaid by the possession of an even lot of thriving youngsters.

As regards young dairy-stock, there is much difference of opinion amongst farmers as to the effect of different methods of feeding and management on the milk-producing powers of the heifer or cow. The effect of heavy or light feeding and of the use of so-called fattening foods; the desirability of bulky rations for heifers in the expectation of developing the barrel and powers of digestion; the best age of calving for heifers, and the effect on later milk-production of the age at first calving, are all points which the practice and experience of many generations have not definitely settled, and which cannot be settled by the experience of any one man. Doubtless, certain methods of feeding and management are better than others, and the discovery of these methods must be part of the future work of our agricultural colleges, research stations, and dairy-farming societies.

(B) SELECTION.—The selection of dairy cows is based primarily on the external appearance of the individual animal, and, as yet, to a less extent on the records of the yield and quality of the milk produced by the animal or its ancestors. The method of selection by external appearances—that is, by the possession of certain characteristics which are considered to denote good milk production—has been in general use for centuries, but, in spite of ample time and much opportunity for practice, the selection of good cows by this method is still to a surprising extent a matter of chance. Undoubtedly, animals showing the characteristics usually associated with heavy milk production—that is, possessing a frame described as wedge-shaped, ample capacity for the utilisation of large amounts of food, a loose, pliable skin and fine hair, a well-developed udder, large milk veins and milk wells, and a freedom of movement showing an active temperament—are more likely to prove good producers than those lacking these characteristics; but, since the introduction of milk recording, many cows have been discovered possessing powers of milk production which were in no way indicated by external features. When judging by appearance alone, even the shrewdest judges make mistakes, not merely as to whether an animal will turn out a poor or a good milker but also as to the difference in yield between recognised good cows.

Large milk veins and milk wells and a capacious udder with large gland development may be the best external indications of heavy daily yields, but these features give no indication as to the persistency of milk production—a factor which is much more important than merely high daily yields. External appearances may enable a good judge to select cows capable of giving 700 to 800 gallons per annum from those giving half that amount, but it is practically impossible

to distinguish between a 750-gallon cow and one which can produce 1,000 gallons per annum.

The writer has frequently asked farmers, when assisting them to commence milk recording, to estimate the yield to be obtained from a number of their best cows, so that their judgment could be checked by the actual records. No one has as yet ventured to give any such estimate, and this fact, associated with the surprises which have followed the results of the first year's records, shows that selection by appearance alone is not a sound method for the improvement of dairy stock.

The only satisfactory way of distinguishing the profitable from the unprofitable in a herd of cows is by the keeping of milk records. It is unquestionable that milk recording has been by far the most effective agent in the improvement of dairy stock throughout the world, and in the future no effort should be spared to increase the membership of existing societies and to form new ones throughout the length and breadth of the country.

The study of the milk record of his herd first increases the farmer's interest in the individual cows, and this leads to a study of how the individual records and the herd average can be improved. Then follow improved methods of feeding, weeding out of the poorest cows, a more careful scrutiny of animals before purchase, a consideration of the relation between yield and quality, and usually the discovery that the best and cheapest way to improve the herd in every respect is by the use of a good bull of milking ancestry, and the rearing of heifers from the cows of good constitution and breeding powers, and possessing good milk records.

(c) BREEDING.—Improvement by breeding is indissolubly bound up with the methods of selection as applied both to cows and bulls; but as the bull exercises an infinitely greater effect than any single cow, and, in addition, has but little value for any other purpose than breeding, the methods of improvement to be discussed under this head deal primarily with the bull. Without exercising great care in the choice of a bull there is no chance of all-round improvement in a breeding herd, and the better the herd, the greater the care necessary to avoid a falling off.

When possible, a pedigree bull of the desired breed should be purchased, but for a dairy herd *pedigree* must be taken to mean not merely a list of names of the bull's progenitors for several generations, but authenticated records of production on the part of the female ancestors (or, where these are unobtainable, certainty that the bull is from a family noted for its milk production). In addition to the pedigree as described, the bull should be from a hardy, healthy strain, with good breeding powers. In studying the milking pedigree of bulls, the percentage of butter-fat in the milk of the dam and other female ancestors should receive attention. There is always the risk, in selecting a bull for a herd of cows where the milk is sold, that the desire for *quantity* will cause *quality* to be overlooked, and should a bull from a heavy milking cow but with a low butter-fat record be used, the average milk of

the herd in a few years' time may be dangerously low in quality. In an individual cow low butter-fat may be overlooked, but not in the dam of a herd bull.

The present-day judging of dairy bulls at our large shows is done entirely on the external appearances and handling properties of the animals, and, while these characteristics are extraordinarily fallible as indications of dairy capacity in the case of cows, they are much more so in the case of bulls. In the noted dairy countries of the world (Denmark, Holland and Belgium) dairy bulls are seldom, if ever, judged by their external characteristics only; the real test of dairy capacity is power to beget offspring with high records of yield and butter-fat, and until this fact is more clearly recognised in this country progress in the breeding of the highest class of dairy cows will be slow and disappointing. The dairy capacity of any animal can be reduced to facts of healthiness and regularity in breeding, and to figures of production, and these facts and figures are a very much surer foundation for a system of breeding than are opinions (which are extraordinarily varied) as to the indications of external characteristics. In relation to this subject the Cattle Stewards and Milking Trial Judges' Committee and the Council of the British Dairy Farmers' Association have had under consideration the conditions of competition for a challenge shield, presented by Robert Mond, Esq., to be awarded annually to the bull whose progeny comply most satisfactorily with certain requirements as to type and milk production throughout complete lactation periods. This competition is the first of its kind in this country, and is a most desirable introduction.

At the present time bulls are usually disposed of before their dairy capacity, as proved by the records of their progeny, can be discovered; in this way many bulls of the greatest value as breeders have been killed before their value was known. In the future breeders should find means whereby bulls can either be kept in the herd, or be leased to other breeders, until the value of their progeny can be ascertained; by this method exceptionally prepotent bulls can be discovered before it is too late.

FORMATION OF REGISTERS OF MERIT.

In the United States the formation of the so-called Advanced Registers of pedigree dairy stock has had a remarkable influence in improving the methods of breeding. The Advanced Register is defined as "a herd book within a herd book, based upon individual merit and designed as an aid to improvement within the breed." Animals in the herd book may, on showing the required degree of merit, be entered in the Advanced Register.

With cows the minimum requirements are stated in pounds of butter-fat only, or in pounds of butter-fat and pounds milk (never in pounds milk only), and may vary according to age; the cows may be divided into classes for every half-year from the age of two years upwards (as in the rules of the American Guernsey Cattle Club), or the minimum yield of butter-fat may be stated for animals calving when exactly

two years old, with a definite and proportionate increase in the requirements for each day by which the age of two years may be exceeded at the time of calving up to five years (as in the American Holstein-Friesian Association); also the requirements may be for a seven, a fourteen or a thirty-day test, or for a period of 365 days. The short period tests are now falling into disfavour, and much more attention is paid to the 365 day records, while recently a ten month period has been introduced.

With bulls, entry into the advanced register depends on a bull having a minimum number of daughters entered into the register; not less than four A.R.O. (Advanced Register Official) daughters in the Holstein-Friesian Association, and in the American Jersey Cattle Club, three daughters from different dams must have been entered on a twelve months' test before the bull is entitled to entry.

The formation of advanced registers or registers of merit in the American Dairy Breeds (Guernsey, Jersey, Holstein-Friesian, and Ayrshire) was commenced about 1901, and although at that time there were the usual prophecies of disaster, it is now recognised that these registers are the natural result of milk-recording, and are invaluable as aids to successful breeding.

In this country only the Guernsey Cattle Society has taken up the subject seriously, but it is now time that all Dairy Breed Societies instituted their own registers of merit. There is also room for the formation of such registers amongst the non-pedigree dairy cows of Shorthorn type, which constitute the bulk of English dairy herds. The milk record societies established in recent years under the Live Stock Improvement schemes of the Board of Agriculture will soon wish to form their own registers of heavy milkers for their own information and to advertise the quality of the stock in their districts. A suggestion by the writer, which appeared in the last Journal of this Association, may profitably be repeated here:—

“Milk Record Societies should form their *local registers*, with conditions of entry which would admit the registration of all cows with good milk records and up to a certain standard in conformation and substance, while a *national register* should be formed by the Board of Agriculture, with more severe conditions of entry, both as regards yield and type.”

DUAL-PURPOSE *versus* DAIRY TYPE.

The foregoing paragraphs have dealt entirely with the dairy bull, and, though it be granted that breeding on the above lines will develop milk, it will be urged that the dairy type of animal is not so suited to the national needs as the dual-purpose type. This contention requires careful study, and the subject is so important and has so many sides that it is almost impossible for one writer to deal with it as it deserves.

The position appears to be somewhat as follows. The dairy type of animal is of value almost entirely as a milk producer; the steer calves may be vealed, and the cast cows may be made moderately fat,

but the type bases its claim to importance solely on the amount of milk produced; the dual-purpose type is of value as a milk producer, and also because the steer calves and cast cows can be fattened readily and add materially to the supply of beef. With the first type the milk yield is higher, the steer calves have a minimum value and the annual depreciation of the cow is high; with the second type the milk yield is slightly lower but the steer calves are in strong demand and the annual depreciation per cow is comparatively low.

From the farmer's point of view the problem is whether his capital, invested in a herd of dairy type stock, will yield a greater profit than if it were invested in a herd of dual-purpose stock. This problem can only be solved by the production of careful accounts kept for a period of years (so that the depreciation may be arrived at with accuracy) for a number of herds of each type. There is no other method of solution. Opinions, however authoritative, are useless unless backed up by facts and figures, and estimates, however carefully compiled, can, with slightly different assumptions, yield very different results.

From the national point of view the problem is whether the dairy type herd or the dual-purpose type herd will yield the greater amount of human food per unit of area and per unit of nutriment consumed. Facts and figures are probably in existence which would shed much light on these points, and their publication would arouse great interest.

Taking England as a whole, the dual-purpose cow is undoubtedly the favourite type at the present time. In explanation of this it would be stated that this type had been found most suitable to the conditions of the country, but this explanation is not convincing. The opportunities of making fair comparisons between the two types have been very few, and it appears equally probable that the present position has arisen without any definite selection on the farmer's part, and is really only a stage in the transition from the numerical superiority of the beef type to the numerical superiority of the dairy type. Similar changes have been noticed in other countries where increasing density of population, the difficulties of transit of fresh milk, the ease of transit of frozen and preserved meat and other changes have led to the replacement of the steer by the cow.

There is also a definite relation between the type of animal kept and the farmer's knowledge of the best methods of management and feeding. The absence of system in feeding and the lack of service and calving books are never associated with a herd of heavy milkers. On the other hand, the more a farmer studies the management and feeding of cows and adopts all tested improvements, the more does his attention become centred on constitution, breeding powers and milk yield, and the less does he consider the fattening propensities of steer calves and cast cows.

SELECTION OF THE BEST DAIRY BREEDS.

There is one other aspect of the desired increase in milk production which deserves consideration—whether the increase takes place by

substitution, by addition, or merely by improvement of dairy stock. Amongst the different breeds of cattle which constitute the dairy stock in this country some breeds are undoubtedly better for milk production than others, and therefore it is nationally, and most probably individually, undesirable that the number of herds of second or third-rate dairy breeds should be increased; in fact, logically, they should be decreased and replaced by herds of first-rate breeds. The argument of local origin, and therefore of special suitability to local soil and climatic conditions, will be used vigorously to support local breeds, but considering the world-wide adaptability of the Shorthorns and Holstein-Friesians, it is doubtful if this reasoning has the force usually allowed to it. The nature of the soil and the location of an individual farm may certainly make that farm suitable only for certain breeds of stock, but there must be many farms where the total production would be greatly increased if the herd of dairy cows of, say, Devon or Welsh type were replaced by a herd of dairy Shorthorns. For milk production in South Devon would not the local breed be beaten by the Holstein-Friesian? If the conditions required for an increase in milk production for sale or for home cheese-making are brought about in the future, the new herds should be only of the most productive dairy breeds. Could not herd competitions be organised throughout the country, which would collect the information required to give some guidance as to which is the best dairy breed, or the best breed for certain conditions? The British Dairy Farmers' Association might take up this suggestion.

Pigs.

Although not classed as dairy stock, there is such a close relationship between pig-keeping and certain branches of dairy farming that this article would be incomplete without some further reference to pigs.

The figures given on page 11 show that Germany maintained 26.6 pigs per 100 acres, whereas Britain maintained only 8.3, and if the increase in numbers of pigs in the respective countries be compared, it will be found that for every 100 pigs in Britain and Germany in 1883, there were in 1912 only 109 in Britain, but 237 in Germany¹⁰. This very extraordinary increase is partly explained by saying that the German is exceedingly fond of pork, the inference being that we in this country are not fond of pork or other forms of "pig meat." It may readily be granted that we are badly beaten by the German in our appetite for pig products, but nevertheless we imported into the United Kingdom in 1913, almost 6½ million hundred-weights of "pig meat" with a total value of over £22,000,000. Of this immense quantity, fully 6 million hundred-weights were imported from foreign countries. It may be to our credit that our imports are some 2 million hundred-weights less than in 1901, but the total value, in spite of this decrease in quantity, has gone up in the same time by £2,000,000.

¹⁰ The figures for Britain are calculated from the Agricultural Statistics, and those for Germany from "The Recent Development of German Agriculture," p. 59.

Surely these facts alone call for a great increase in pig-keeping in this country, and excellent and profitable opportunities for part of this increase should present themselves if cheese-making or other branches of dairying are taken up on a larger scale; pigs can be kept equally well to utilise the by-products whether the cheese-making be done at the farm or in the factory. At the same time, a systematic and widespread effort should be made to encourage pig-keeping on a much larger scale throughout the country. The table on page 17 shows that the pig comes next to the cow in the economical utilisation of food, and perhaps the realisation of this fact by the German Agricultural authorities helps to account for the development of pig-keeping in that country during the last 25 years. Whichever be the more important agent—the German love of pork or the teachings of the agricultural chemist—their joint effect in increasing Germany's food supplies in the present war is incalculable.

SUMMARY.

In the preceding pages the necessity for a great increase in the numbers and productivity of the dairy live stock of the country has been shown by:—

- a A comparison with the numbers of previous years, which shows that the increase in stock has not been nearly proportionate either to the needs of or the increase in the population.
- b A comparison with other countries, which shows that previous to the war, Britain was much behind other European countries in yield of milk per 100 acres, and, though favoured with a better climate and soil, was forced to import large amounts of dairy produce from some of these countries. The space devoted to a comparison with German results does not mean that we have necessarily most to learn from Germany, but rather that the figures for such a comparison were most readily obtainable. A detailed comparison also shows that the cause of the higher milk production in other countries is the larger number of cows kept per unit of area.
- c A consideration of the needs of the nation, which shows how necessary it is that Britain in the future must produce, not merely all the new milk required, but the largest possible amount of other dairy products. As all dairy products—cheese, butter, condensed milk, etc.—are made primarily from milk, the essential requirement is an increased milk supply.

This desired increase necessitates the investment of new capital in dairy farms, etc. Unless the profits from milk production are likely to afford a satisfactory rate of interest on this capital, and unless there is a sufficient supply of labour, the desired development of milk production will not take place. If reasonable security for capital and sufficient supplies of labour are forthcoming, the increase in milk production will follow by one or both of the following methods:—

a Increase in the number of dairy stock,

b Increase in the milk yield per cow.

Increase in numbers may take place by the substitution of dairy stock for beef stock and sheep, and good reasons are given for such a change on suitable areas. It is clearly shown that the cow can convert the crops of the field into human food in a more economical manner than any other animal. Increase by addition to the present numbers of all kinds of stock will give the greatest total increase to the food supply, but this increase is dependent on the provision of an equivalent amount of home-grown roots, fodder, and grain.

Any appreciable increase in the numbers of dairy stock must of necessity lead to a reconstruction and rearrangement of the farm buildings on many farms, and the introduction of all possible labour-saving devices. It is probable that the formation of large dairy herds may be the most profitable mode of increase.

Increase in yields can be brought about by improved methods of feeding, of selection, and of breeding. In feeding, a much more general knowledge of scientific principles, and of systems of feeding according to the milk yield, would give beneficial results. In selection, the external characteristics considered to indicate dairy capacity are not reliable enough and must be supplemented to the greatest possible extent by reliable records as to breeding, and yield and quality of milk. In breeding, the dairy bull is chiefly considered, and emphasis is laid on the desirability of judging bulls by the records of their progeny rather than by their own external characteristics. The formation of Registers of Merit for cows and bulls of the various breeds, and for non-pedigreed cows of any breed, is also advocated, as in other countries such registers have been invaluable as guides to improved breeding.

Brief reference has been made to the difficult question of whether the dual-purpose type or the dairy type of cow is the more profitable animal for the farmer and for the country, and the point is also raised as to whether it would not be better to concentrate methods of increase and improvement on a small number of dairy breeds, rather than to try to increase and improve all breeds which claim to have some dairy capacity. Finally, the desirability of a large increase in the numbers of pigs is referred to.

In preparing the foregoing pages, the writer has come to realise acutely the impossibility of dealing satisfactorily in one article with all the aspects of this subject. On some points definite suggestions for improvement could be given, but on many others all that could be done was to make clear the urgent necessity for further investigation in order to supply the information required as a basis for improvements. If the required increase and improvement of dairy stock is to be carried out on the best lines, there must in the future be closer study of the methods which have brought success in other countries, deeper and wider investigation of problems in this country, and the adoption of all means which will bring more knowledge within the reach of the farmer.

MILK PRODUCTION.

By C. W. WALKER-TISDALE.

THE matter of producing the greatest possible quantity of food in this country has at last obtained the interest of the Government, and this interest has been forced upon it by the curtailment of imports due to the German submarine menace.

The development of England in the past has been centred chiefly on its manufacturing industries, and whilst one school of thinkers has always pointed out the futility of neglecting agriculture and concentrating attention almost entirely on the development of other industries at the expense of agriculture, not really until the last four or five years, when moneys from the Development Fund were devoted to agricultural education and investigation, was anything of really great importance done by the Government for agriculture.

Now, as a result of the war and a European famine looming in the distance, thought is primarily centred upon how Great Britain can increase its food supplies.

The daily average loss of some 20,000 (twenty thousand) tons of shipping sunk by submarines, and utilization of a large proportion of our shipping for transport purposes, is reducing the merchant service so much that the people of the country are likely soon to have to depend very largely—at any rate during the War—on home-grown supplies.

The development of agriculture during the last 30 years has chiefly been promoted by private enterprise and through the agency of various agricultural societies throughout the country, which have worked without Government assistance, and done much to better agriculture in general.

Statistics, however, show that despite what has been done, our production per acre of agricultural produce has not developed during the last 25 years to any considerable extent, but, allowing for the favourable conditions that are existent, very much more could be got out of the land than has ever before been produced.

With a view to becoming a self-supporting nation, prior to the inevitable war which its policy foreshadowed, Germany has been devoting itself very strenuously to the development of its agriculture, with a result that during the past 25 years it has enormously increased its production of nearly all classes of agricultural produce.

With a view to contrasting English and German agriculture and showing how much the British farmer might get out of his land, a very valuable booklet has been prepared by T. H. Middleton, C.B., Assistant Secretary of the Board of Agriculture. This book is entitled "The Recent Development of German Agriculture," and is issued by the Board of Agriculture at the price of 4d. (Fourpence), and is deserving of the careful study and attention of every farmer.

methods adopted in the growing of corn, potatoes, &c., are not inferior to those of Germany. The difference in production is largely due to the circumstance that in Britain more than two-thirds of cultivated land is now grass, while in Germany one-third of the cultivated land is grass. German land is mostly tilled by peasant owners, British land by tenants.

Germany depends to a great extent on women labour, and, whilst wages are relatively low in Germany, rural industries help to provide winter employment and cheapen summer labour.

Technical agricultural education has been developed in Germany now for a great many years, and the State has aided industry by spending large sums on development and employing tariffs to steady prices.

Co-operation amongst farmers in Germany is very largely employed. Thus it would seem that nowadays, taking all these points into consideration, and the favourable view of agriculture held in this country by the greater portion of our populace, and the aid likely to be forthcoming from Government, that much may be done by farmers to develop all classes of agricultural production.

The development of the milk industry in this country has progressed at an extraordinarily rapid rate during the past 15 years. Nevertheless, the average yield per cow kept throughout the country can still be improved enormously.

It has been variously stated that the average yield per cow in Great Britain lies somewhere between 350-400 gallons. This includes cows kept for the purpose where milk is sold, where it is made into cheese or made into butter, as well as the cows which are kept almost solely for the purpose of suckling their calves.

That this is a very low yield is evident when it is realised that very many good herds produce an average of 750-800 gallons per cow per annum. From this it will be seen that it might be possible to double the amount of milk produced throughout the country, and anything like this would easily surpass the German production. But to double production of any article, especially milk, is a difficult matter, and one which takes time and patience to realise, and in order to affect the whole country, the spirit and enthusiasm of every farmer must be raised. Thus, whilst the poor cow yields 350 gallons per annum it is possible to get the cow which yields 1,000 to 1,400 gallons, and not so difficult to get one which produces 800 gallons. In the development of milk production there is probably nothing so important as the keeping of milk records and, unfortunately, in the past these have not been greatly favoured by farmers in general.

Starting in 1903, Scotland has probably appreciated milk recording most, and undoubtedly benefited thereby, but it has not been until the last five or six years that any appreciable amount of milk recording has been done in England, Ireland or Wales.

Farmers in general have not a liking for figures, but it is only by obtaining figures and ascertaining what each cow in the herd is actually producing that improvements may be made. When once milk records

are being kept there is much more inducement for farmers to breed their own milch stock, which is almost essential in the building up of a heavy milk yielding herd.

The main item at the moment is to produce larger supplies of milk, and this can only be done by getting the right class of cows.

Milk selling is the most popular form of dairying nowadays, but there is, unfortunately, a serious decline in the breeding of their own stock by large numbers of farmers engaged in it. Many milk sellers become practically dealers, and whilst keeping a herd of 40 or more cows, never rear any of their own stock. These herds are what might be termed "flying" herds, as the cows are not retained for usually more than one or two years, and the herd is being continually changed. It is argued that this system of dairy farming is the more profitable, owing to the fact that only cows giving plenty of milk are retained, and, in fact, the average quantity of milk per cow yielded by such herds runs to a high total of gallons in the year. But it is not this class of farming that will help British agriculture, as it is undoubtedly leading to a deterioration of stock, for no care whatever is paid to the class of bull kept, and the calves from such herds, which go away into other districts to be reared, are ultimately thrown on the market, and if they come back into dairy herds again, being ill-bred, are anything but the best of milkers.

All dairy farmers should be encouraged to keep and rear the best of their stock while the bull scheme recently promoted by the Board of Agriculture should, if the right type of bull is kept, do much to improve the quality of the progeny in so far as milk production is concerned.

Apart from obtaining the right class of stock, there is the right method of feeding and treatment to be adopted, in order to get the best results, and no man can study too deeply the food requirements of dairy cows in order to get the best results at the lowest expenditure in cost. A scientific knowledge of the composition and qualities of feeding stuffs is of great value, and herein lies the importance of a good general agricultural education embodying theory as well as practice. Lastly, there is the all important factor of having the right class of labour for attending to dairy cows. A proper knowledge of the right methods of treating and handling animals is very essential, in order to get cows to thrive and produce the largest possible quantity of milk. Too much attention cannot be paid to seeing that the milking is carried out in a thoroughly efficient manner, and, under the present war conditions, women labour could be employed on the farms to great advantage in cow tending and milking.

The latter is work especially suitable for women. The charge of cows and milking is undoubtedly onerous work, but for women who are volunteering for farm work at the present time, and who are unable to engage in harder physical labour, the minding of cows will prove of the utmost value in helping to increase food supplies.

BUTTER PRODUCTION.

By G. SUTHERLAND THOMSON, F.R.S.Ed., B.D.F.D., N.D.D.

BRITAIN is the world's market for butter. Every oversea country in which dairying is looked upon as an industry contributes to the demands of the British consumer. What part does the mother country, as she is familiarly termed in our Dominions, play in providing her own people with this nutritious food? Let us examine the question and see where we stand.

We consume the butter made locally, which is the output of England, Scotland and Ireland, and we consume Australian, New Zealand and Canadian exports, also butter from the Argentine, Siberia, Denmark, Sweden, France, and Holland. The grand total for the year ending June, 1916, was 148,351 tons. Of this huge import only a small quantity would be re-exported or consumed out of Britain. The figures for the past 10 years show that we imported 2,016,400 tons of butter, or an average of 201,640 tons yearly, and the table appearing on page 36 illustrates to what extent various countries participated in the trade.

It will be observed that Denmark outrivals all other competitors to a considerable extent, Russia is second, and Australia third. But the total from the oversea dominions is not much more than half the Danish export. The output of English, Irish and Scottish creameries and buttermaking establishments is not obtainable, therefore cannot be commented on. We know, however, that it would be a modest aggregate compared with the colonial figures.

Turning the imports for the year ending June last into money, what does it represent? Taking the average wholesale price of butter at 1s. 2d. per lb. it amounts to £19,384,530, of which Denmark and Russia get £7,200,834 and £5,451,805 respectively. The position is made clear by the average wholesale London top prices of salt butter per hundredweight, which are as follow:—

| For the Year ending 30th June. | These are Quotations for Choicest Quality. | | | | | |
|--------------------------------------|--|--------|-------|--------|-------|---------------------------|
| | 1907. | 1908. | 1909. | 1910. | 1911. | Five years' Average |
| | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. |
| Danish, Swedish ... | 116 3 | 120 3 | 116 3 | 122 2 | 116 8 | 118 4 |
| French | 113 7 | 113 3 | 111 6 | 117 10 | 119 0 | 115 0 |
| New Zealand | 106 8 | 115 3 | 111 9 | 115 5 | 109 1 | 111 8 |
| Australian | 105 0 | 111 10 | 106 9 | 111 9 | 105 6 | 108 2 |
| Russian | 100 2 | 108 4 | 106 7 | 109 4 | 103 6 | 105 7 |

| For the Year ending 30th June. | These are Quotations for Choicest Quality. | | | | | |
|--------------------------------------|--|-------|-------|-------|-------|---------------------------|
| | 1912. | 1913. | 1914. | 1915. | 1916. | Five Years' Average |
| | s. d. | s. d. | s. d. | s. d. | s. d. | s. d. |
| Danish, Swedish ... | 132 2 | 127 3 | 125 2 | 143 8 | 173 2 | 140 3 |
| French | 138 4 | 125 6 | 125 2 | 133 3 | 153 4 | 131 1 |
| New Zealand | 125 8 | 117 4 | 116 3 | 136 5 | 161 3 | 131 5 |
| Australian | 121 9 | 112 1 | 111 9 | 131 5 | 153 3 | 126 1 |
| Russian | 119 10 | 109 1 | 107 0 | 126 2 | 133 1 | 119 0 |

Figures are convincing and show conclusively that the British Empire is painfully behind in providing butter for the British consumer, and the worst offender is undoubtedly the United Kingdom. In the matter of price as well as in quantity, we have to give the honours to Denmark, and this little country is followed by France, New Zealand, Australia and Russia, in order of the averages reached during the past five years.

Statisticians decline to recognise the British-made article, but we know that the price realised for best English butter is satisfactory, for it has the advantage of being freshly made, and can be marketed as such.

WHAT IS WRONG ?

The manufacture of creamery butter in Britain has not developed beyond the tentative or experimental stage. The public look to overseas countries for their butter, notwithstanding the fact that vast tracks of country in Britain are suitable for dairy farming and buttermaking. To visitors from overseas dominions failure to make the best use of the soil occasions great surprise. Our New Zealand, Australian, Canadian, and South African soldiers are largely drawn from the land, and many have had home experience coupled with "roughing it" in their adopted countries. They are excellent judges, and what they say of our lethargy as dairymen is far from complimentary. One visitor, who was disabled and had taken to the country to recuperate, expressed himself thus: "This is a magnificent dairying country, a gold mine compared with my part of the dairy world, but it appears to be preserved for the artist and the sportsman. I wish we could take home with us the whole of England, climate and all, and we would want no more for ourselves, our children and very many generations to follow." To those with experience of the British dairying industry, experience of the Dominions and other progressive and productive parts of the world, the astonishment that overtakes the practical man from abroad can be fully understood.

Let us examine the question in a frank and unprejudiced manner. In the first instance how does the British climate compare with that of Canada, Australia, New Zealand, and with foreign competing countries, viz., Denmark, Sweden, France, Holland, Russia and the

| Year ended 30th June. | BRITISH DOMINIONS. | | | | FOREIGN. | | | | | | | | | GRAND TOTAL. |
|--------------------------------|--------------------|---------|----------------|-------------------|-----------------|---------------|---------|---------|--------|---------|---------|--------------------|-------------------|-----------------|
| | Aus- tralia. | Canada. | New Zealand | Total British. | Argen- tine. | Den- mark. | France. | Holland | Norway | Russia. | Sweden | Other Countries | Total Foreign. | |
| | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. |
| 1907 | 34,023 | 8,220 | 14,852 | 57,095 | 2,410 | 87,273 | 13,316 | 8,707 | 1,344 | 32,425 | 10,882 | 5,825 | 162,182 | 219,277 |
| 1908 | 22,396 | 1,862 | 11,492 | 35,750 | 2,430 | 91,248 | 16,945 | 9,562 | 1,263 | 30,487 | 11,118 | 2,331 | 165,384 | 201,134 |
| 1909 | 16,180 | 2,386 | 13,631 | 32,197 | 4,475 | 93,050 | 19,875 | 10,490 | 1,529 | 32,612 | 13,236 | 3,111 | 178,378 | 210,575 |
| 1910 | 28,770 | 1,162 | 16,705 | 46,637 | 2,924 | 84,632 | 20,212 | 8,270 | 1,210 | 29,426 | 15,352 | 2,301 | 164,327 | 210,964 |
| 1911 | 44,395 | 776 | 15,852 | 61,023 | 932 | 88,379 | 14,665 | 6,272 | 1,295 | 30,201 | 18,671 | 1,352 | 161,767 | 222,790 |
| 1912 | 33,677 | 2,997 | 16,183 | 52,857 | 2,603 | 80,398 | 8,333 | 5,337 | 1,615 | 30,757 | 17,123 | 1,172 | 147,338 | 200,195 |
| 1913 | 26,414 | — | 13,416 | 39,830 | 4,400 | 82,546 | 13,167 | 6,584 | 1,211 | 35,194 | 16,000 | 378 | 159,480 | 199,310 |
| 1914 | 26,076 | 41 | 16,609 | 42,736 | 2,358 | 88,935 | 11,328 | 7,572 | 778 | 41,056 | 17,996 | 665 | 170,638 | 213,414 |
| 1915 | 21,848 | 443 | 17,920 | 40,211 | 4,314 | 82,258 | 17,651 | 7,462 | 2,580 | 26,537 | 7,993 | 1,394 | 150,179 | 190,390 |
| 1916 | 6,363 | 1,188 | 18,371 | 25,922 | 5,791 | 54,662 | 12,748 | 640 | 1,087 | 41,723 | 2,898 | 2,880 | 122,429 | 148,351 |
| | 260,142 | 19,075 | 155,031 | 434,248 | 32,637 | 833,381 | 148,240 | 70,886 | 13,912 | 330,418 | 131,269 | 21,409 | 1,582,152 | 2,016,400 |

Argentina? All are engaged in the manufacture of dairy produce for the British consumer.

Unlike Australia, Britain is only a temporary sufferer from drought, and there is no excessive heat as experienced in Australia and Canada. Floods are no barrier to dairying in Britain, and the winter is mild and open, not like Siberia. In fact the British climate may be said to be similar to the New Zealand, and New Zealand is one of the finest butter producing countries in the world. We may therefore dismiss the climate as being a factor against the success of buttermaking in Britain.

What about the soil and the contour of country? The quality of the land varies from rich to poor, but the average for the maintenance of the dairy cow is decidedly good. Variety of soil is an element favouring dairying, and compared with Denmark, whose reputation for butter is a household word, there is more undulating country in British counties. We cannot, with safety from adverse criticism, lay the fault of a struggling butter industry at the door of an unproductive soil, no more than we can heap the blame upon the climate.

Turn our attention to the cow, and see how the British dairy farmer compares with his oversea competitors. Britain is the foundation of dairy breeds. Practically every noted herd of milking stock in the Empire has upon it the hall-mark of British supremacy in this vital branch of dairying. You will find the imported cow and her offspring providing a good living for the farmer abroad under conditions of climate and soil that would be considered unfavourable and unprofitable in the homeland.

We now reach a stage in our subject which is peculiarly interesting and fascinating. I refer to the market for the world's butter supply. How closely this is forged by industry cannot be properly grasped by anyone who has not had an opportunity to study on the spot what milk production, buttermaking, transport, and the various channels through which the finished article passes before it reaches the British consumer. Take the case of Australia, for example. In the heat of summer, milking begins in the early hours of morning. In many cases the cream is transported long distances by road or rail to the creamery. Creameries may be cut off from railway communication, which adds to the labour and cost of transport, still under these adverse conditions the industry grows and flourishes. We have, finally, the conveyance of the butter from the creamery to the steamer, and thence to Britain. In ocean transport, skill and care are necessary in the preservation of the produce to prevent the development of taints and defects, which may be said to be foreign to the British buttermaker.

How does all this compare with snug British farms in a cool climate, near a creamery and a railway, and with the market and consumer at the door? Again, we fail to find a reason for the modesty of butter production in Britain. What then is the cause? Is the high price of land the chief enemy of butter production? I venture to think this a reason that cannot readily be pushed

to one side. Rentals are high, and in peace time they have been, in many cases, above the market value of produce. Legislation has a sure remedy for this painful weakness, viz., a judicial cutting up of Britain, when many of the sins that underlie production would disappear. In the past there have never been enough farms for farmers. Scarcity of land, and consequently keen competition have brought fictitious rentals, and the rich or gentleman farmer has been able to outbid the man with less capital. We must not lose sight of another important factor, viz., an increasing demand for milk. Milk farms have contributed to the high price of land, because of the prosperity of this class of dairy farmer. The milk grower has enjoyed cheap and effective railway transport for his produce. The buttermaker has not enjoyed the same advantage or consideration. Wealth and land restriction have become inseparable, and this has helped to destroy the equilibrium of British dairy production.

IS EDUCATION AT FAULT?

Turning our attention to education. Is it at fault? I should say we have here great room for improvement. Dairying education is too decorative. Men and women are granted licenses to teach butter-making on the evidence of a good memory, regardless of real ability and efficiency. A language or a recital are tests of memory, but an ever-changing science and practice tax qualities of the mind that require special care and attention in development. Ask the student what changes come over sugar in cream by the action of micro-organisms and he will recite the answer. He is in difficulties if you question him on the various factors in flavour, upon which the merits of choice butter depend. He has not given this a thought, because he has not been taught the value of applying science to practice.

Applied Science.—Why not substitute “applied science” for “theory” and, if possible, banish the latter from the school curriculum? The meaning of theory is exceedingly doubtful, and is certainly open to abuses, while “applied science” grips one as being both helpful and scientific. In our dairy schools we have the lecturer in theory. The student will tell you that he need not be a practical man, because he is a teacher of theory. The danger is obvious, and theory is a cloak that hides the blemishes of the teacher. Theory that cannot be blended with practice and turned to commercial profit is mere padding, and, therefore, useless to the man who is to apply his training to make a living. Judging from actual experience, I frankly think that at least 50 per cent. of the theoretical instruction given to-day at British dairy schools may be termed the waste product of the lecture room. Instead of a teacher of theory let us have, in future, a teacher of applied science.

In selecting teachers of buttermaking the utmost care is required. There should be no opportunity to qualify as an instructor or instructress after a few weeks of training. What is the value of the examinations or tests conducted in some British counties? They are insufficient to qualify a teacher to lay a sound foundation in the

future buttermakers of the country. If you peruse the examination papers of some of our "schools," you will find glaring defects. The absence of questions on commercial buttermaking strikes one as a very serious omission. Things commercial are supposed to be learned by experience bought in the bitterly contested markets. The victims will tell you that the price is high, and the result disheartening. I quote the following question and answer to help to explain my meaning:—

The Buttermaker's Question.—Please examine sample of butter and let me know if the quality is good from a commercial standpoint. I am making butter for the market, not for the home, and the price it realises is not satisfactory.

The "Expert's" Answer.—This is a nice sample of creamery butter, but you should be more careful with the grain and see that it is not larger than grains of wheat, also churn at a temperature not higher than 54 deg. Fahr. in this weather.

Here we have a person making butter for the market and eager, no doubt, to succeed. Advice is wanted from the teacher, and the above reply is all that is forthcoming. The grains of wheat theory is childish, to say the least of it, and fixing the temperature at 54 deg. Fahr. may be adding insult to injury. The answer to this question given by a teacher trained to fully appreciate that the word "commercial" in buttermaking is linked with more than production, would have something of this character:—

I presume from your letter that you are dairy farming near London and you market your butter there, but you do not inform me if you dispose of it in bulk or in pounds. If in bulk, I should advise you not to sacrifice flavour for texture, as bulk butter is pounded by the grocer to meet counter requirements. When sold in pound weight more care of texture and minor points is looked for, but again flavour is the deciding factor. In the sample sent, flavour is weak and the cause of this I cannot say without visiting your dairy and inquiring into cream ripening, temperature, and general treatment of the butter. Meanwhile develop a little more acid in the cream, churn at a temperature that your experience shows is the best. Work the butter carefully, and if your worker is defective and polishes the butter instead of pressing it, replace the roller by something more suitable. Your butter being below market value is evidence that something serious is wrong, and I should also advise you to look carefully into the question of marketing. Send a further sample for examination, and carefully answer the questions in the enclosed schedule.

Our Competitors.—Well-educated businesses study competition and learn all they can of their competitors. Does this not apply forcibly to butter production? In the opening pages of this contribution we have overwhelming evidence that Britain is discredited in her own market as a supplier of butter. Have dairy schools looked

into the subject of competition, and brought under the notice of teachers the urgency of imparting useful instruction on butter production in Denmark, Sweden, New Zealand, Australia, Canada and the Argentine? On this question a harvest of knowledge may be found of vital interest to British dairying. Overseas authorities in dairying know far more of the British butter market and its requirements than the teacher at home. They study it commercially, and their decisions are put into practice and the issue is profit. "From the farm to the table of the consumer" is the stock lecture of oversea dairying countries. In the oversea mind, buttermaking does not begin with the ripening of the cream and end with printing the butter, neither does cheesemaking begin with the vat and end with the curing room. It is recognised that every stage must be intelligently studied from the cow to the consumer's table, and the scientist, and the practical and commercial man know that they must work together in the great industrial competition. Oversea instruction grapples manfully with other subjects that are equally urgent here but are overlooked. Of these may be named practical research, refrigeration, machinery, milking machines, manufacture of various dairy products—as condensed milk, milk powders, casein, &c. Margarine also claims attention, and developments in this food are watched with a keen practical mind.

Marketing.—We have referred to this subject. It should not be loosely considered by our educational authorities. It deserves an honoured place in the school curriculum. By its absence the buttermaker enters a cold commercial world without a necessary escort. The British dairy student is allowed to remain aloof from the world's markets. He is not initiated into the final examination of the finished product, and he is kept in darkness as to the ups and downs of the saleroom. He has a vague idea of what the consumer wants, and what he does not want. The marketing department of the dairy should be as serious a question as any in the buttermaker's apprenticeship. If one is without a knowledge of such subjects as markets, faults of manufacture from the market and consumer's standpoint, prices, and methods of marketing, excellent work accomplished as a practical and scientific buttermaker may be lost. It is true that quality tells, but it does not always find its proper level if left alone to win popularity and create a demand. It must be properly "placed" as the commercial man would say, and given the opportunity that its quality merits. We are taught to accept that only actual experience will guide one in the marketing of produce. Experience is certainly a teacher of the highest order, but there is much that the young student can be told that would be of the utmost value and help when the responsibilities of manufacture and marketing claim his attention. The writer would impress upon all buttermakers not to overlook this fact, and they should not hesitate to bring what influence they can to remedy the omission. Marketing of butter in Britain is faulty. It has been of immense help to the margarine trade, because it was

impossible to avoid the deterioration of vast quantities of butter under present conditions of storage and distribution. But this does not apply to the country that ships the largest quantity of butter to Britain, and which realises the highest price. I again refer to Denmark.

BLENDING.

This has developed into a huge business. It is actively associated with the treatment of faulty butter, but the reader must remember that choice butter is used in the blending factory to rescue these inferior qualities. Faulty marketing favours the blender: the careful maker of butter who fails to market it properly finds that his labours are to the advantage of the blender, for he may, and often does, receive as little for his choice butter as the maker of an inferior article. Blending is only a profitable way of patching up the trouble, and the profits do not reach the producer. This is a serious matter—the initiation of a new industry out of the faults of a national industry. It is necessary for the blender to purchase the finest quality to mix with inferior butter, otherwise his object would be defeated. Turning to texture, we find it inferior in the blended article, which is the result of the severe treatment the butter receives in the process of mixing. But the consumer does not appear to take any exception to this, the ease with which blended butter spreads on the bread would seem ample compensation for the injury to texture.

Let us now briefly consider, under the following headings, arguments used in support of blending:—

1. Excess of unsaleable butter.
2. Want of uniformity in the quality of butter.
3. Weak-bodied butter.
4. District requirements.
5. Increase of butter substitutes.

1. *Excess of Unsaleable Butter.*—There has always been a large quantity of unsaleable butter made in Britain. The absence of factory dairying and of a sound system of instruction and marketing have contributed to this weakness. It might be asked, "What becomes of the inferior British butter that cannot be sold on its merits?" It is largely bought up by bakers, or, if cheap enough, is secured by the blender.

2. *Want of Uniformity in the Quality of Butter.*—Denmark realised from the very beginning of her butter business with Britain that success depended upon the export of a uniformly high-class article, and this has been maintained till the present day, while other countries have disregarded the danger, with the result that they have invited substitutes to enter into competition with their exports. Denmark holds the highest place in the British market for choice butter—a standard quality—and not, as we generally hear, through her geographical situation and her winter dairying, which are certainly valuable adjuncts.

3. *Excess of Weak-bodied Butters.*—Those having experience of different dairying countries and their exports are familiar with the vast differences that are found in the natural flavour, texture, and colour of butter. Choice Australian and New Zealand butters are noted for their fine flavour, robust body, and high keeping properties and for this reason are most valuable for blending with weak-bodied and spongy butters which reach the London market from other countries.

4. *District Requirements.*—It is well known that in different counties of Britain salt and colour are features of butter which influence the sale. The fancy of the public is partly met by the blender, who can provide an article that fulfils the requirements of the district, and finds satisfaction with the small grocer who is the chief patron of the blending factory. The grocer recognises it is a business advantage to have his surplus "off" flavoured butter treated by the blender with a better product, thereby enabling him to dispose of what might otherwise be left on his hands. This has been an incentive to the blender.

5. *Increase of Butter Substitutes.*—This explains why the small grocer finds an increasing difficulty in disposing of his surplus stock of butter. Lard, margarine, and other substitutes meet the requirements of the baker and cook with apparently greater profit than butter. It is, therefore, very necessary for butter manufacturers to realise that the public require a more uniform butter than has been provided in the past.

Blended versus Unblended Butter.—Blended butter, being a mixture of two or more classes of butter, possesses a superior flavour to the poorest quality used in the blend, but the mixture has a less attractive flavour and a lower keeping property than the choice butter upon which its value chiefly depends.

The question of a declining supply of butter has been dealt with, and attention has been given to education, marketing and blending. Let us turn to faults in the manufacture of butter. It is unnecessary to mention good points: they will take care of themselves; but the weaknesses will only get worse by neglect.

Unpasteurised Butter.—The manufacture of this class is universally adopted in Britain, and the reasons generally given are as follows:—

Pasteurisation is not considered necessary, because the butter is made for early consumption, and pasteurisation would add to the expense without bringing a correspondingly higher price. The additional cost in equipment and labour, and the limited output at the average creamery, are arguments against any department from the present system. But the chief reason is the satisfaction that choice unpasteurised butter gives to the public, for this class of butter cannot be surpassed in flavour.

Quite true, but the fact remains that the market in peace time, when butter was more plentiful than it is at present, showed an excess of inferior British butter. "Give me Danish," the villager would say to the grocer. Denmark knows what is wanted and supplies

it. Is it unpasteurised butter? Not one ounce. All has been treated in a similar manner, treated by thoroughly trained practical and scientific men. One system prevails and dare not be departed from, and that system is known as pasteurisation. In New Zealand it is adopted, and in Australia necessity is making it popular. What is the object? It is to extend the keeping properties of butter, which is a vital factor. The system is also valuable with supplies of cream of doubtful bacterial quality, and every creamery has some experience of butter made from this class of produce. Where there is the slightest suspicion that cream is not what it should be, pasteurisation can effect great advantages, but if the cream is decidedly "off" pasteurisation will not save the butter. Much can be done with faulty supplies by a process of neutralising the cream followed by pasteurising. By this means, excellent results have been obtained in New Zealand and Australia. Samples of the treated butter from Australia, which have been submitted to the writer for examination, support the innovation. As already shown, pasteurisation is not generally practised in Britain, notwithstanding that education in buttermaking is now fairly general, and of late years has made somewhat rapid progress. Want of uniformity and a preponderance of stale flavours are the chief faults of the British product, and nothing could be more damaging to the reputation of a dairy than butter that cannot be depended upon.

We have in Britain numerous buttermaking competitions, the object being to raise the standard of local buttermaking. These competitions have a value, chiefly from a mechanical standpoint, but no experienced person would be guilty of deciding the capacity of a buttermaker on the floor of an exhibition hall. We erroneously look upon some functions of the buttermaker as vital to success, and college examiners may be found to fail candidates in certain elements in practice, which to many of the most famous buttermakers abroad have only a passing significance. It would, therefore, follow that no matter how skilled and perfectly informed a candidate may be on the vital questions of cream and ripening, a failure may result, because of what the examiner might consider an unpardonable mistake in practice. I believe that seldom has butter scored one hundred points at the London Dairy Show. One exhibit from South Australia achieved this rare distinction. The makers were old students of the writer, and they had learned by experience to put to one side some of the practices which to-day are sacred in England. They riveted their attention to the selection and ripening of the cream, and did everything reasonable to retain in the butter the fine flavour which the cream possessed. The law of churning into grains of a very definite size was not in force when this butter was made. It was the acidity and temperature that were mastered, upon which the making of gilt-edged butter so much depends.

A marked difference in the consistency or fat content of cream is a common error, that is to say, a supply of cream is made up of quantities which differ in the percentage of fat, and in cases of this

kind there is irregularity in ripening which cannot be overcome in the subsequent treatment. Secondly, temperature of ripening is not sufficiently understood, and nothing can be more important to flavour. It is in the finish of the product that the British buttermaker triumphs, but what gladdens the eye is no guarantee that the palate will be satisfied. An excellent texture and an attractive appearance are poor compensation for a ruined flavour, and buttermakers might do worse than take this censure to heart. As an incentive to improvement, a rearrangement of points in butter scoring might be adopted. If we accept flavour as a deciding factor in the purchase of butter, and accept it we must, it is imperative that flavour should be given a higher scale of points than the minor or less important elements. Butter that has a good texture and appearance is surely of less importance than that of imperfect texture and finish but with the flavour superfine. Many purchasers on the wholesale and retail market would not hesitate to make their selection in semi-darkness, because they subordinate all features to the vital or dominating qualification—flavour. Let not these remarks, however, detract from the importance of texture, colour and finish, as each has a relative value, particularly texture. To all experienced judges flavour and texture show a relationship which may be illustrated in such defects as cheesiness, tallowness, and fishiness. But it is a mistake to attribute faults in texture to manipulation of the butter. Greasy butter, for example, may be entirely caused by “greasy cream,” and in diagnosing the cause a judge would be in error to say that it was the result of carelessness in working. In the majority of instances of injured texture, the direct cause may be traced to the condition of the cream at the time of churning, and the buttermaker should be familiar with this to secure the best results. The value of flavour compared with texture and finish may be compared by the following scale of points :—

| | | | | | | |
|---------|-----|-----|-----|-----|-----|----|
| Flavour | ... | ... | ... | ... | ... | 70 |
| Texture | ... | ... | ... | ... | ... | 25 |
| Finish | .. | ... | ... | ... | ... | 5 |

A stage has been reached at which an appeal must be made for the necessary help to place buttermaking on a more solid foundation. It is wrong and unfair to say that buttermaking is dead in Britain and that margarine should take its place. There is room in the United Kingdom for both. Choice butter will not lose its identity as a valuable food, and if margarine has killed the inferior butter trade, it is not to be regretted. Steps to prevent the manufacture of the inferior article and to protect the good against abuses in the market, should claim earnest attention. Problems beyond the industry should be dealt with by the State.

HOW THE PRODUCER CAN HELP.

He must wake up from a state of lethargy and do his bit, also he must demand that others do theirs. The producer can centralise his efforts and co-operate.

The manufacture of dairy products in Britain is conducted in a spirit of independence; it is proprietary. Without co-operative cohesion it is very difficult to build up a strong and prosperous business. The bulk of imported butter is made in co-operative creameries, and nothing responds more to success in buttermaking than amalgamation under one roof. Efficient control of the raw material can be secured, and marketing better supervised. With small creameries operating in a district you have an industrial tug-of-war, with its numerous dangers and reactions. Farmers would do well to give this matter serious attention, and not to endorse schemes which are fashioned on an insecure foundation, or show a spirit of adventure.

We have a golden example of the value of co-operation in Denmark, and our Colonies are moving steadily in a similar direction. When will Britain wake up? It may be queried whether a combination of butter and cheesemaking offers attractions to the man on the land. If it can be carried on successfully in other parts of the world, why not in Britain? A butter and cheese factory offers a considerable saving in construction and equipment, and is less expensive to maintain. With the chief departments of dairying side by side, or combined under one roof, one particular weakness in British dairying can be more readily overcome, viz., refrigeration. It is an indisputable fact that the use of low temperatures in the treatment of milk, cream, butter and cheese is not properly appreciated in Britain. More produce goes to waste during the hot summer months than would pay the interest on this class of machinery. To my knowledge large quantities of cheese suffered irreparable injury last summer through the absence of cool curing rooms, and the raw and manufactured products of the butter factory were equally affected. A complete installation, providing the power to efficiently carry out all necessary operations, would be a step in the proper direction. This can only be done in the case of factories that are not impoverished for want of funds at the outset, and where the possibilities of development warrant a liberal expenditure. Small buttermaking establishments should not be encouraged, for reasons already stated. Buttermaking on the farm, however, is another question, and as this has a fairly extensive connection in Britain, it is necessary not to overlook its importance.

HOW THE CONSUMER CAN HELP.

Give the consumer quality for his money, and make it convenient for him to obtain the produce he requires, and he will help. There is no finer advertisement than uniform quality. It is partly because British butter is unreliable that the demand is uncertain. We are told that the consumer will buy only in the cheapest market. Might I ask if Danish butter is advertised like numerous brands from obscure places? Nevertheless, the demand for Danish butter is keen, and it is at the highest market price throughout the year. Danish butter is to be had summer and winter, and there is no disappointment when a customer asks for a supply from the grocer who stocks it.

With Australian and New Zealand butter, also with Irish, the season in which it is for sale is our British summer, with the result that the popularity of the produce suffers and this reflects on the demand.

HOW THE STATE CAN HELP.

The State can, and should, be a powerful arm of the industry. Unlike the Governments of some foreign countries, and our Colonies, the British Government has stood to one side, and allowed the industry to struggle along. One would almost think that dairying was beneath the dignity of its office, was unclean and unworthy. The British Dairy Farmers' Association has put up a brave fight for the producer in the face of heavy odds. It has taken a terrible War to plainly unmask our position in the production of food for man. Coddling by the State is bad, but culpable negligence of agriculture in an island country is a crime. When an industry is left to itself, evils are allowed to breed, and muddle and decay follow. There should be one supreme hand at the helm. When this is the case, local or parochial influences become subordinated to a fearless policy of progress, carried out by capable and intelligent men. The British soldier has seen what France has achieved, and he will return to his native land determined that the day has arrived for a change in the policy of agriculture, be it in the making of butter or cheese or the growing of crops.

Parochialism has been mentioned. Let me point out what it means. This is certainly a disease that has become established in Britain. It enters into every phase of our agricultural life, and if parochialism is studied, one finds abundant evidence of its highly destructive properties. "Parochialism" and "tradition" are inseparable. In buttermaking the enemy is rooted. "Parochialism" refuses to take a broad and courageous view of things. Every county in Britain is in its grip and, until this is fully realised, the road to a vigorous and healthy development of dairying will not be found. Appointments are created and filled on parochial lines, things are said and done in accordance with its doctrine, and jealousy and intrigue are its partners. Contrast the "activities" of some pampered officials with strong, resolute men, who put merit and honour in the fore-rank, and you have "parochialism" versus "progress." All along the agricultural line, the former has won to the utter subordination of the latter. The erring family circles should be attacked by a ruthless hand and decency infused into all departments of dairying, for each is contributing to the common cause. It is the duty of the State to take the initiative as a fitting example to the country. It is also the duty of the Government to take the premier place in the education of the buttermaker. What can be achieved in this direction? A complete revision of the syllabus of instruction throughout the country and a standard for all set up. It should be made impossible for any person to teach buttermaking who has not qualified according to a prescribed law passed by the State. The Government should appoint all county instructors, and the best of brains should be selected at a fitting price. At present, instructors

are got in the cheapest market, so to speak, and the result cannot be satisfactory.

The State should provide a model butter and cheese factory, equipped with everything that is necessary to the successful manufacture of produce. This would be a guide to the country of what is best, and all factories to be built would be compelled to fulfil the requirements of law as to situation, construction and equipment. With a model State factory under proper management, and conducted as a business concern and made to pay, the producer would have something to work upon far more convincing than the spirit of the lecture hall. It has proved an unqualified success abroad, and I know of nothing that should prevent the same being repeated here.

With a representative Government Dairy Department, it would be an easy matter to institute a Bureau of Advice where information on markets and on business questions connected with butter would be at the disposal of the producer.

For the regulation of food supplies, to prevent congestion and consequent market fluctuations, and losses in the quality of produce, the erection of cool stores in various centres, for the efficient storage and preservation of butter and perishable produce, would be a welcome addition. This is a matter for the State, as shown by the experience of various countries.

Working in conjunction with cool stores, the grading of butter could be effectively undertaken. If this were done, the careless buttermaker would be singled out and the careful man would receive the reward his diligence and care merit. Marketing would be improved, and half the evils of manufacture attacked. Why do I write in this positive strain? Simply because I have had long experience of grading, and have seen what it has accomplished. In South Australia I introduced the grading of dairy produce as a means of raising the standard of butter and to eliminate weaknesses in manufacture, and in Queensland I got it included in the Dairy Act, with the result that grading has contributed far more to the present healthy condition of the industry there than any other reform. The Dairy Acts of Queensland, including additional clauses, which the writer has for long advocated, have now been passed into law in New South Wales, and compulsory grading of cream and butter are the two main features of the measure. If it is a success to classify export butter in a country many thousand miles away from the British market, why not adopt it here? Consider what grading has done for New Zealand dairying, where it has been practised for many years, while in American cities it has been followed with great advantages to all sections of the industry. Arguments against grading were strong in Australia, but facts have clearly supported the way of the reformer, and to-day the value of compulsory grading has dispelled the last hope of clinging to haphazard methods.

Research.—Men who have devoted years to research work have been poorly rewarded in Britain. They have been treated

more as cranks than patriots. A great scientist goes to his grave and a brief obituary notice in the press states that he has done some useful work in the field of science. Compare this with the attention given to the memory of a football player or a cricketer. One would then think that the nation had been robbed of a mighty force that would be difficult to replace. This illustrates the indifference shown to science. It is not the fault of the people so much as it is the fault of the State. Science has been discreditably ignored by the British Government, while in foreign countries, where industries are competing in the British produce market, every nerve is strained in the labour of research, and the State is the great teacher.

A vigorous Department of Dairy Research, staffed by men of repute, and not hindered by State economy, would be welcomed by every progressive dairy farmer in the kingdom, and the result would soon justify the expense of such an institution.

What is outlined here as State assistance is far from being an impossible task. It is quite within accomplishment in a few years if only the will to succeed is put into practice.

A scheme of State Agricultural Banks may be deemed necessary to prevent the inroads of the professional speculator and controlling investor. State Banks have been a godsend in Australia, and those who have been "made" by their help may be counted by thousands.

CONCLUSION.

In this contribution I have frankly expressed what I believe to be the chief causes which are preventing a healthy expansion of buttermaking in Britain. Wise legislation is necessary to remove the obstacles that stand in the road of national progress. Commercial, not decorative dairying should be kept in mind.

Much has been taught and written on the subject of butter, and, if examined, the instruction is found to be muzzled by conditions and circumstances that remain unchanged from year to year. It is the duty of the State to remedy this. And if the industry is to expand to provide more food for man, the first requisite is to provide the land at a "living" rental. Oversea countries have found the remedy. Britain should no longer hesitate to do likewise. The great evils of British dairying are quite transparent. The writing is on the wall—short supplies and soaring prices—and none should shut their eyes to the fact, or remain indifferent.

I have had a wide experience of buttermaking in different parts of the world under varying conditions of climate and market, and have endeavoured in the preceding pages to point out the defects in British buttermaking, and to propose remedies.

CHEESE PRODUCTION.

By WM. GOODWIN, M.Sc., Ph.D.

IN the following article an attempt will be made to forecast the lines upon which an increase in the quantity of cheese produced in this country might be made. It is unfortunate in one sense that any such inquiry should be undertaken at a time when conditions are so abnormal, but, on the other hand, it is precisely at the present moment that attention is being paid to all sources of our national food supply.

Whilst it would not be correct to base any opinion upon prices prevailing at this period, there is very much to be gained by a proper appreciation of the position which has arisen through the war. To profit by this experience and to direct our national energies to improvement in the future is clearly the aim in dairying as in other industries.

Long before the war began there was abundant evidence to show that the supply of milk in most districts was being directed more and more to the towns, and that cheesemaking was falling off except during that period of the year when the quantity of milk was too great for the demands of the fresh milk trade.

Before going on to consider what is likely to be the future of cheesemaking in this country, it might be well to briefly call attention to the nutritive value of the various dairy products, for in weighing the advantages and disadvantages of any particular system of dairying due attention must be paid to the most advantageous utilisation of the total food value of the milk.

If by an increase in cheesemaking a larger amount of food can be produced and made use of by the country at large, then it is clear that efforts should be made to develop this branch of the dairying industry, and to endeavour to arrange for its increase on lines which will yield the producer of the milk a net profit equal at least to that which he would obtain under any other system.

The food value of whole milk is recognised, and its suitability for the young need not be pointed out here. Even for the adult person milk is a cheap and valuable food, and when taken in combination with foods of a carbohydrate nature, *e.g.*, rice, tapioca, bread, &c., it provides a well-balanced diet, and the cost is small.

When butter is made from milk it is the fat only which is utilised, and the nitrogenous part of the milk (which is so valuable in repairing the waste of muscular tissue) goes away in the separated milk. Although this separated milk is used for feeding calves or pigs, and so is far from being wasted, it does not directly serve as human food, except to a limited extent.

That greater use could be made of separated milk, particularly for cooking (in which case some other fat such as suet can be added to take the place of the butter fat), is now generally recognised, and the introduction of separated milk into the dietary of the working-class population would be a distinct gain, if care were taken to point out its unsuitability for infants and young children.

Cheese, on the other hand, contains all, or practically all, the nitrogenous part of the milk, together with the fat; the bulk of the milk sugar and a small amount of nitrogenous material being removed in the whey.

It is clear therefore that cheese is a highly concentrated food, and, bulk for bulk, it has a feeding value practically double that of the best cuts of beef. When properly ripened, it increases in digestibility and palatableness, so that a meal of bread and cheese provides a diet upon which hard work can be performed, and at the same time the food is appetising.

No exact figures as to the amount of cheese made in Great Britain are obtainable for the Census of Production statistics do not include cheese made by farmers or cheese made from surplus milk. On all hands, however, it is agreed that the supply of home-made cheese has fallen very considerably. Some comparison of the position might be possible if the Census of Production figures for 1914 were available, but these have not yet been published.

Turning for a moment to the import of cheese, it will be seen that very large quantities reach these shores each year, chiefly from our Colonies and America. The Board of Trade returns, as quoted in Messrs. Weddel & Co.'s Annual Review of the Dairy Trade, show the following figures during the past five years:—

| Year ended 30th June. | Australia. | Canada. | New Zealand. | Total from British Dominions. | Total Foreign. |
|-----------------------|------------|---------|--------------|-------------------------------|----------------|
| | Tons. | Tons. | Tons. | Tons. | Tons. |
| 1912 | 98 | 72,690 | 24,993 | 97,776 | 116,838 |
| 1913 | 238 | 66,424 | 29,489 | 96,151 | 117,396 |
| 1914 | 1,067 | 60,763 | 33,856 | 95,686 | 118,895 |
| 1915 | 1,048 | 62,192 | 32,515 | 95,755 | 131,320 |
| 1916 | — | 70,341 | 32,563 | 102,904 | 127,246 |

The making of cheese on farms has unquestionably declined, but it still survives to a very considerable extent in certain districts where the industry has been long established, and where facilities for sending milk by rail are, or were, perhaps, not particularly good. Cheshire, Staffordshire, and Shropshire; some parts of Lancashire and Leicestershire, Somerset, Wilts, and the South-West of Scotland have all continued to produce cheese on the farms and, the quality being high, the returns have been satisfactory on the whole.

The setting up of milk-condensing factories has also had a considerable influence (in Derbyshire, for example) upon cheesemaking on farms, for the factories have shown themselves to be ready to

relieve the farmer of many obstacles which previously were the chief causes of his keeping the milk at home and making it into cheese.

In other districts the selling of milk has become the chief industry, and the freedom of the farmer and his wife from the labour of cheese-making and the uncertainty of the return have undoubtedly done a great deal to make the former system more popular.

It is not to be wondered at that a farmer prefers to sell his milk either direct to the town or to a wholesale milk dealer, for he is able to make a yearly or half-yearly contract for a quantity which he feels capable of producing, and he knows exactly what price he will obtain. By carefully regulating the size of the herd and the time of calving, it is possible for a farmer to supply a fairly regular amount of milk, and not to be troubled with too much except for a short period.

The supply of milk has not exceeded the demand of late years, except during the early summer months when the flush comes, and in consequence prices have risen. The increase has not, of course, been all gain, for even before the critical times of the past two years there was a continued rise in the costs of production, and farmers were experiencing difficulties in getting milkers, &c.

However carefully the supply of milk is regulated, it is almost impossible in normal years to avoid a certain excess during the early summer, and as this surplus is not needed in the towns, it has had to be dealt with by the farmer at home. Usually the farmer's wife has made the surplus milk into butter, or less frequently into cheese. The making of butter was not in the circumstances a very profitable undertaking, for the price which was obtained from the sale of the butter was often low. Still, it was a means of utilising the excess of milk, and it was possible to utilise the separated milk for rearing calves or feeding pigs.

The increased use of margarine which has recently arisen will, in all probability, militate against the sale of butter which is not first class, so that it will be in the interests of a farmer to endeavour to find some output for his surplus milk which will yield him a better return than buttermaking.

If a larger amount of milk could be regularly produced, and at a price which would be relatively not higher than the normal, then, after the demands of the towns for fresh milk had been met, the surplus could be utilised for making into cheese.

Owing to the convenience and certainty of the fresh milk trade, it is clear that as long as farmers can sell what they produce they will not undertake the risks of cheesemaking. If, however, the amount of milk produced in the country were greater, and such an increase seems to be possible by an extension of arable farming (more particularly the growing of green crops, which are so valuable in milk production), by the improvement of the yields of individual cows, through selective breeding, &c., then this extra milk could be most profitably utilised for the making of cheese.

A comparison of the amount of milk produced per 100 acres of cultivated land in Great Britain and in Germany is given in

Mr. Middleton's report upon the recent development of German agriculture. After allowing for the extra imported feeding stuffs used by the British farmer, it is shown that the production of milk on a German farm is nearly twice what it is on a British farm.

It is clear that this extra milk is not due to superior pastures, for the grass land in Germany compares badly with that in England. A knowledge of German methods of agriculture also leads to the conclusion that more intensive arable farming and a larger milk production per cow are the main causes of the difference. The same conclusions are arrived at with regard to other dairying countries, such as Denmark, Sweden, and to a less extent Holland. In these countries dairy cattle of first-class milking strains are bred with great care, and the influence of this system permeates all classes of milk producers. As an instance of the improvement in the quality of dairy stock in Denmark, it may be noted that whilst in 1888 the yield of milk per cow was on an average 385 gallons per annum, this figure had increased in 1913 to 580 gallons. Similar increases are shown in other countries, and the work of the milk recording societies in Scotland proves conclusively that the raising of the production of dairy cattle can be accomplished if care is taken to weed out unprofitable cows and breed from those of high milk yields.

Until the milk supply of this country is increased, either by extensive or, far better, by intensive, methods, it is not likely that cheesemaking will make much advance, so that any provision for the fostering of the industry must always be contingent upon this fact.

It is no use urging farmers to make cheese if they can sell their milk and obtain as much (or perhaps more) profit as they would by the more laborious system of cheesemaking. At the same time, it is most desirable that every encouragement should be given to farmers to make cheese at home, for although a great extension in this direction hardly seems probable, there are nevertheless many farms which from their situation are well adapted to cheesemaking, and as experience shows much success can be achieved in this direction.

The instructional work in cheesemaking which has recently been started at the instigation of the Board of Agriculture and Fisheries by certain County Agricultural Committees is undoubtedly leading to a revival of interest, and will result in the starting of the industry in some districts. This instruction will also serve to show how much more profitable cheesemaking is than buttermaking, and it has the further advantage that it is the commencement of the training of cheesemakers, of whom considerable numbers will be needed if there is to be an extension of cheesemaking in this country.

It is not however upon the increase of cheesemaking on individual farms that any great advance in the industry can be looked for. The great difficulty of the extra work, particularly for the farmer's wife, will always remain; and it is quite understandable that whilst a woman may be willing to make butter twice a week for a part of the year, she will hesitate to bind herself to making cheese daily during the season, and having all the attendant worry.

There seems to be only one way in which a larger amount of cheese can be profitably made, and that is by the amalgamation of farmers in some form of co-operative dairy. Given an increase in the milk supply of a district, there ought not to be much difficulty in the starting of a dairy equipped with proper appliances both for dealing with fresh milk and for making cheese.

Cheesemaking is now a regular part of the work of a number of large co-operative dairies which supply milk to the towns and make cheese of the surplus.

This is particularly helpful at the time of the flush of milk, for at that period the milk is well suited to cheesemaking, and the utilisation of the excess prevents the losses which the farmers would otherwise have to face.

The Agricultural Organisation Society has kindly furnished particulars of the quantity of cheese made in co-operative dairies in England during the past year. Twenty-three cheesemaking societies dealt with a total of 12,000,000 gallons of milk, and of this amount roughly half was made into cheese, giving a produce of close upon 1,300 tons. This quantity is, of course, small in comparison with imported foreign cheese, the average quantity of which is about 125,000 tons.

The policy of these cheesemaking dairies is on the whole very similar. As long as there is a demand for fresh milk the supplies brought in by the farmers are sent out either to the towns or to wholesale milk dealers, but at the period of the year when surplus milk is produced the dairies begin to make cheese.

Given suitable premises and a good cheesemaker, there is no doubt that large quantities of high-class cheese can be made by these farmers' organisations, and the advantages of some such system are now recognised by the milk producers. A further advantage which the farmer gains by the co-operative system is that it keeps up the price of milk in the towns by removing the surplus which would otherwise be sent to dealers who could only pay minimum prices.

There has always been a waste of valuable food in the early summer months, for the individual farmer is only concerned with finding some means of getting rid of his surplus milk, and the usual method, as already mentioned, has been to make it into butter, which had often to be sold at a very low price. An alternative to the making of butter is now provided in the shape of miniature cheese of the "smallholder" type. The demand for cheese of this kind has been exceptionally good of late years, and as it can be made on any farm and does not require any expensive outfit, there is every reason to expect an increase in production.

The Report of the Steward of Dairying at the Royal Agricultural Society's Show held at Manchester this year clearly points out how these miniature cheeses can be used for the working up of small quantities of milk. The money returns from the cheese are also much more satisfactory than from butter.

The making of small cheese is of special interest (and more particularly at the present time) to those milk producers, who, owing

to the exceptional position they occupy, are not able to bring their surplus milk to a central dépôt, where it can be worked up into large cheese.

It is also probable that once cheesemaking has been introduced into a district on these simple lines there will be an extension to other and larger varieties, but too much reliance should not be placed upon this hope, for it is only in a small number of cases that a farmer who has once given up cheesemaking for the selling of fresh milk will return to the former system.

The advantages both to the farmers themselves and the country as a whole seem to lie in the founding of properly equipped dairies of such a size that they can be worked profitably, both as collecting centres for milk to be forwarded to the towns and also as cheesemaking factories at certain periods of the year.

Some of these farmers' dairies have been carried on successfully for a number of years, and their extension may be looked for in the near future. The cost of equipment is not heavy, and as farmers themselves find the capital and sit on the Committee of Management they are directly interested in the financial results.

Numerous advantages can be claimed for a properly equipped and managed dairy which makes cheese. In the first place, the cheese is made by a qualified cheesemaker, and the produce is therefore likely to be more uniform than if made on individual farms.

There is the added advantage that a large amount of cheese can be disposed of at once, which suits buyers and cuts down the cost of carriage.

In the second place, the farmers who send their milk to a dairy where cheese is made are soon made aware that only clean milk is wanted. The cleanliness of milk is often lost sight of when the milk is sent off at once into the town, for the bad flavours which are so fatal to good cheesemaking do not develop if the milk is cooled and used within a short period.

There can be no doubt that greater attention to the conditions under which the milk is produced would be a great blessing, and one way of driving home the lesson of clean milk is for the producer to be interested in the making of cheese.

It is impossible to make high-class cheese with dirty milk, and if the milk is not received in a satisfactory condition at the factory, no skill on the part of the cheesemaker can undo the damage which has been done.

The question of provision of capital has been a deterrent in some districts in the past, for where the farms are not large and not in a very flourishing condition, it is sometimes difficult for the farmers to spare the necessary money to take a share (based, let us say, upon the number of cows which are kept).

This difficulty promises to be less in the future, for the prosperity of farmers during the last two years must result in a saving of money, some of which could be invested in a co-operative dairy of the type mentioned above.

Even in those cases where capital could not be directly subscribed

by the farmers, there should be no difficulty in obtaining the money by some form of co-operative credit society.

An extension of cheesemaking by farmers' societies would mean increased pig-keeping, and this industry is capable of much development. Supplies of foreign bacon and hams are not keeping pace with the demand, so that the home-grown articles are likely to find a ready market.

The further step to the founding of a co-operative bacon-curing factory is not a long one, and this would ensure the best use being made of the by-products of the cheesemaking industry.

The selling of milk and the making of cheese do not go very well along with the raising of calves, but just as at present some farmers specialise in calf rearing and are willing to use some of their milk for that purpose and for making butter (the separated milk going to the calves), so in the future there will no doubt be a continuance of this system. On many farms from which milk is sold it has become rare to rear calves, and this is particularly the case in those districts whence milk is sent to London. When the quantity of milk begins to fall below the amount for which the contract has been made, the farmer buys cows to enable him to produce the quantity of milk required by his contract. The dry cows often then find their way to the butcher, and much valuable breeding stock is lost.

To keep up the supply of milk cows somebody must pay attention to the calves, and there is no doubt that on some farms it would be a profitable business if calf rearing were undertaken on a large scale.

Even though milk selling and cheesemaking do not favour the rearing of calves, it is possible to raise very creditable stock on a minimum amount of milk. Substitutes for milk (after the calf has reached a certain age) have been successfully tried at the Royal Agricultural Society's Farm at Woburn, at the West of Scotland Agricultural College Farm at Kilmarnock, and more recently at the Midland Agricultural and Dairy College, and the trials have shown that it is possible to rear calves on substitutes which are neither expensive nor difficult to provide.

An extension of these experiments will certainly be made, and it is probable that experience will result in more calves being raised on some of the mixtures which have been found to yield good results.

Although it is not possible to obtain figures which show exactly how the production of cheese now stands as compared with previous years, there is no doubt that there is an increased demand for English cheese, and experience shows that when properly introduced home produce is preferred to either colonial or foreign.

Even as recently as 1900 the cheese sold by a large co-operative society in the Midlands was largely colonial, not more than 15 per cent. of the sales being English. In 1913 the proportion of English cheese sold was 99 per cent. of the total sales. Owing to the scarcity of English cheese during the past three years there has been a return to the Canadian, but the decline has only been some 2 or 3 per cent., and if the home produce were available it could be sold.

In the large towns there is difficulty at certain periods of the year

in getting good class English cheese comparable with that coming from the Colonies as regards price. Also, as in other branches of provisions, it is found that the taste of customers is inclined by use towards those articles which they are in the habit of buying.

It becomes therefore absolutely necessary to ensure regular supplies of any particular variety of cheese if the trade in a district is to be maintained, and it is no less important that the quality should be uniform. When the factor and the retailer can rely upon a regular supply of cheese of uniform quality, then sales are effected without difficulty. It is a common experience that a good cheesemaker can sell his produce without even showing it to the buyer, for the latter knows from experience that he can depend upon the quality, and the retailer depends to the same degree upon the factor.

Foreign cheese, particularly when it was fighting for the English market, was carefully selected (just as the Danish butter was), and it was not until a high grade uniform article was sent here that the consumers were satisfied.

Canadian cheddar and Gorgonzola, for example, can be bought in any small town, and the demand for these cheeses continues, because of the fact that consumers accustom themselves to the flavour, and object to the difference in taste of other cheese.

This point, although it may appear to be of little significance, is really very important, for once a regular demand for home produce is created, the prices are likely to remain steadier and the makers of cheese can count upon better returns.

The high price of meat has led to the use of cheese in many cases and in view of the world's shortage of meat it is most desirable that this change should be fostered.

It cannot be disputed that a considerable amount of poor cheese is produced at home, and some of it from other than whole milk. In the interests of makers it would be good if some standards could be laid down for the representative English cheese, for, if this were done, not only would the quality of the home produce be raised, but if the standards were applied equally to foreign-made cheese there would be no unfair competition such as occurs when "half meat" or "filled" cheese are sold as genuine.

Some difficulty might be experienced in devising standards which would be generally applicable, for the cheese would differ in composition according to the quality of the milk and the method of making, although, as is well known, the Dutch Government have established a system whereby a distinctive brand is granted for the use of the cheese control stations which are under supervision.

This control system is a rigorous one, and is designed to prevent cheese made from milk from which some fat has been extracted being sold as whole-milk cheese.

Cheese eligible for the Government mark must contain not less than 45 per cent. of fat in the dry matter, in the case of "full cream" Gouda and Edam cheese, whilst an Edam cheese made from milk from which a little cream has been skimmed must contain at least 40% of fat in the dry matter and is also distinctively marked.

Further, the makers of the cheese must not be connected with the margarine industry, nor must oil or fat be stored on the premises.

A register showing the quantity of milk used in making the cheese and the weight and destination of the finished product must be kept. Canada has also a well-organised cheese control.

It is most unfair that cheese made from milk which has been deprived of some of its fat should be sold as whole-milk cheese, for the latter cannot approach in price the figure at which the former cheese can be sold at a profit.

It would be possible to give greater encouragement to the making of "half meat" cheese if the whole-milk cheese were branded so that an inferior article would not be sold at a price beyond its value.

For certain purposes a "half meat" cheese serves admirably, and by careful attention in the making it is possible to produce an article which would be assured of a regular market. The utilisation of separated, or better, skimmed, milk in this way would produce human food of high feeding value.

The case is in some respects analogous to that of butter and margarine; the two can exist side by side if one is distinctively marked so as not to be substituted for the other, to the detriment of the buyer.

An extension of the cheesemaking dairies would tend to uniformity, and even if Government action were not taken some system of voluntary control and the issue of a certifying mark would go a long way towards improving the quality of the output. The Friesland Co-operative Dairy Association has worked under a system of this description for a number of years, special identification marks being used to indicate "full cream" and "half meat" cheese of the Cheddar and Cheshire type.

Briefly summarised, the position as regards cheesemaking in this country appears to be as follows:—

- (1) Milk selling will not decrease, but cheesemaking will more than ever take the place of buttermaking when surplus milk has to be dealt with. An increase in milk production would allow of milk being used to a greater extent than at present in the making of cheese.
- (2) Farmers will co-operate in order to (a) effect economies in the distribution of their milk; (b) make cheese of the surplus; (c) prevent prices falling when milk is very plentiful.
- (3) An extension of cheesemaking should be encouraged and adequate teaching should be provided for farmers' wives and daughters, so that on suitable farms cheese may again be produced, and in any case any surplus milk could be made into cheese (if only small cheese) rather than butter.
- (4) Every effort should be made to create a demand for high-class English cheese, and so meet the competition of foreign produce by an article which would be assured of a market at remunerative prices.
- (5) The food value of cheese being greatly in excess of that of butter, it is more advantageous to the country that milk should be utilised for the making of the former rather than for the latter article.

THE UTILISING OF BY-PRODUCTS IN THE DAIRY AND AVOIDANCE OF WASTE.

By JOHN BENSON.

THE chief by-products of the dairy are separated and skimmed milk, butter milk and whey. Separated milk is of the chief importance, and is produced in large quantities where butter and cream are manufactured. For many years after the introduction of the cream separator the disposal of separated milk was the bane of the factory manager. In summer, as milk for direct consumption, it was practically unsaleable, and any attempt to make it into cheese was only a partial success. I recall the time when separated milk could be purchased at the creamery at one penny per gallon, and in winter have purchased this article at 2½d. per gallon though delivered to a distant station. These prices were altogether out of proportion to the real value of this by-product, as separated milk contains a large percentage of valuable nitrogenous matter. Of late years, however, the value of separated milk has appreciated, and the difficulty is now to secure a supply, even at high prices. During the present winter dried machine-skimmed milk has realised 96s. per cwt., and 10d. per gallon has been paid for separated milk in wholesale quantities.

The chief question now before us is how to conserve the large quantities of separated milk which are still available at our creameries and dairies in the months of May, June and July, and still practically wasted in many instances, so that this valuable material can be made available as food for man and beast in winter or in times of scarcity.

Separated milk can be utilised and conserved by manufacture into cheese either in its original state or mixed with new milk, or with a proportion of cheap fat. In my opinion, however, the manufacture of separated milk into cheese in any form is not the most economical method of dealing with it. The milk sugar and certain albuminoids are lost. A small proportion may be used in the manufacture of Caerphilly cheese which, however, is only in limited demand, and is a cheese of really a second-rate character. A cheese made wholly of separated milk is barely edible; mixed with a cheap fat it is a little better, but does not keep well; if mixed with new milk in any appreciable proportion for the manufacture of Cheddar, Cheshire or Derby cheese, the flavour and texture of such cheese is so lowered as to considerably affect the selling price, while the maker is rendered liable to prosecution for selling an adulterated article. Where a factory is chiefly concerned in the manufacture of butter, a very fair cheese can be made from separated milk to which has been added, say, 10 per cent. of buttermilk. This cheese, if well made, is soft in texture, but must be sold quickly, as it does not keep well.

Probably the best method for the large creamery to adopt is to convert the separated milk into dried powdered milk. This entails a considerable outlay, but dried separated milk, properly prepared, will keep good for a considerable time, and is much used by bakers, and biscuit manufacturers, and in the manufacture of proprietary foods. It is also now being used in considerable quantities when procurable for domestic purposes, chiefly in the preparation of household bread, puddings, &c. Mixed with water in the proportions by which this substance has been extracted in the process of manufacture, it forms an excellent food for children, and entirely obviates the difficulty of obtaining separated milk during the winter season. It has recently been demonstrated that dried milk—both new and separated—is equal in every respect in the feeding of infants to either the best qualities of fresh whole milk or separated milk, and possesses the further advantage of not disseminating tuberculosis or other diseases often associated with the consumption of raw milk.

In some districts where milk is largely converted into butter by farmers on their own premises, factories have been established for the purpose of converting the surplus separated milk into dried milk, and an extension of this system seems desirable when adequate quantities of milk are available. It is usual in this case for the factory to collect the separated milk, paying a fixed price to the farmer, and there the farmer's liability ends. It could, however, be conducted on co-operative lines with advantage to all producers of milk. Many buttermaking farmers may assert that all separated milk is used by them in the feeding of calves and pigs; but is it not a fact that at certain seasons of the year more separated milk is available than can be profitably used, and that overfeeding is only another form of waste?

Another method of preserving separated milk is to condense it in the usual manner, but as this ordinarily entails the use of large quantities of sugar its adoption at the present time is not to be recommended.

The problem before us is to preserve in some form the abundance of milk which is produced in the summer time, so that it shall be available in times of scarcity. The drying of the surplus milk is the best solution of the difficulty. By this means all the valuable constituents of the milk are conserved and made available for future use. This dried milk keeps well, and compared with the distribution of raw milk, the cost in this connection is negligible. Railway expenses are reduced to a minimum, and car space is saved. In seasons of abundance milk can be withheld from an over-loaded market, thereby avoiding dislocation of trade and temporary reduction in the market price of the raw material.

In the case of the isolated farmer or small-holder who has separated milk to spare during the summer months, and where no facilities for drying are available, the casein of milk can be preserved for future use in the feeding of pigs and poultry by converting the milk into curd by the addition of rennet. The curd is cut and dried as much as possible as in the ordinary process of cheesemaking. The dried curd

is then placed in a barrel in a granular state and covered with strong brine. Additions of curd are made when available till the barrel is full. The brine should entirely cover the curd when filling is completed, and in this state it can be left until required for use. As curd preserved by the above method naturally contains an excess of salt, it should, before use, be broken up finely and washed in clear water, so as to remove a portion of the salt, as an excess of salt is not good for either pigs or poultry. To avoid danger in this connection and to furnish fat and carbohydrates in which curd is deficient, it should, before being used, be mixed in proportion of one part of curd to four or six parts of maize meal, wheat offals, or barley meal, and with scraps of fat from the house.

To make the most of separated milk the farmer who is in the habit of feeding pigs with raw milk should always remember that it is best fed in a slightly sour state. Perfectly sweet milk is liable to cause constipation in pigs, and there is often loss from this cause.

Where separated milk is fed to calves it is, of course, necessary that the milk be sweet, but to avoid loss of calves through hoven or indigestion, the milk should not be fed direct from the separator, but be allowed to stand for an hour or so before use. All separated milk fed to calves should be at animal heat, cold milk being often a contributory cause of white scour, a disease responsible for the loss of many young calves.

Where producers of milk supply a central factory and take back their proportion of separated milk daily, they should insist on the separated milk being pasteurized before its return. Factories are supplied by many farmers, some of these indifferent as to the health of the animals under their care. If the precaution of pasteurizing the separated milk be not insisted upon, then it may become a hot-bed for the dissemination of tuberculosis and other animal diseases. In the early days of creameries, I have found whole districts suffering through the spread of disease where the separated milk was returned to farmers in its raw state. This is of course a serious waste of animal life, and a great loss to farmers interested in the creamery.

In my opinion, all milk intended for direct consumption, whether new or separated, should first be pasteurized wherever possible. The saving of good material during hot weather is immense, and all danger from diseased or contaminated milk is avoided. On the other hand it has been repeatedly stated that pasteurized milk is not so digestible as raw milk, but after many years' experience of the milk trade I fail to find any evidence that this belief has any foundation in fact. In these times of stress imagine what pasteurization means in the saving of valuable material and of labour. The farmer need only deliver his milk to the factory once daily. Full churns of milk of a good standard quality can be dispatched daily to the retailer. The buyer need not to worry himself as to the keeping qualities of the milk. Retail delivery can be made once daily, thereby saving an immense amount of labour, and also making the work of delivery suitable for women with family ties. Further than this,

the householder receives an article with good keeping properties and perfectly safe in use.

The tendency is now for the larger dairy companies to pasteurize the whole of their milk supply, and I honestly believe this to be a step in the right direction. I readily admit that this method of treating milk is hardly possible in small towns drawing their supplies from adjacent rural districts, but farmers interested in the retail trade might consider the advisability of establishing central depôts in all small towns where milk could be treated in a proper manner, and distributed more economically. If the war continues, something will have to be attempted in this direction, and soon, as the waste of man power in the present system of the distribution of milk is scandalous.

As has been previously stated, the other by-product of the butter-making dairy is buttermilk. In England this is usually fed to pigs, and is altogether an excellent food for these animals. In Scotland and Ireland it is, however, largely used for domestic purposes, both the genuine buttermilk and soured whole or separated milk. The Scotch use this in the manufacture of excellent scones, and in both countries it is largely consumed along with other foods with beneficial results. What better than the excellent scones prepared with buttermilk which could be purchased at the Dairy Show in the good old days? We have had an era of Metchnikoff and his famous bacillus, but the rage for this particular form of soured milk has died down. In my opinion good clean buttermilk is equal or even superior in health-giving properties to any of the much advertised preparations, which are in reality so difficult to manufacture.

Modern English methods of buttermaking usually, however, result in spoiled buttermilk. The addition of water to the butter at the breaking stage largely spoils the buttermilk. This can, however, be easily avoided by having the cream for churning of a thinner consistency to commence with, the maker draining off the buttermilk immediately the butter forms. There is really no necessity for the addition of water at the breaking stage. It is only done for the sake of getting a good "grain," and I am sorry to see that this fad has been carried to ridiculous extremes. Buttermilk to be of value should be pure. The addition of water renders unpalatable a valuable food. It is also an offence against the law to sell buttermilk diluted with water.

In the manufacture of cheese, whey is, of course, the principal by-product. The best results in pig-feeding are obtained by using the whey as fresh as possible. Much of the chief feeding constituent—sugar—is lost if the whey is allowed to become too sour. It is sufficiently sour when drawn to promote digestion. To make the best use of whey, whey tanks should be kept clean and regularly emptied. The filthy stuff pumped out of whey tanks at some factories with which I am acquainted is of little feeding value, and not a desirable food even for pigs. Some modern factory managers pasteurize the whey by the simple method of admitting high-pressure steam into the vessel

containing it, and when the whey is returned to the farmers this is of great advantage. By adopting this system the valuable feeding properties of whey are preserved and the milk cans more easily cleansed before being returned full of milk to the factory.

In some cheese factories whey butter is made. This, however, should not be necessary. A large amount of fat in whey indicates a careless cheesemaker, and if fat is lost, other valuable constituents of cheese are lost also.

Much fat in whey is the result of careless handling of the milk, and a form of waste which is far too prevalent.

Possibly it might be worth the while of some of the larger cheese factories to produce milk sugar in a raw state now that the foreign supply is cut off. Milk sugar, however, can never supplant beet or cane sugar for domestic use, because of its grittiness and only slightly sweetening properties. It is, however, valuable for many purposes, and especially as an addition to milk to be employed in the feeding of infants.

Sweet whey contains about 4·8 per cent. of sugar, and much of this can be recovered by evaporation. The least expensive method is for the factory to evaporate off the excess of moisture by the aid of steam or other heat. The sugar remains in the form of a gritty material of a grayish colour, and in this state it is readily sold to merchants to be refined.

To deal now shortly and particularly with the various causes of waste in milk selling, buttermaking and cheesemaking. Many milk producers seem to think that the milk strainer removes all defects due to careless milking and dirty surroundings. If the visible dirt is removed then all is well. This is, of course, a serious mistake, as no amount of straining will improve milk which has been produced under dirty conditions or milked by dirty milkers. The damage has already been done. Anyone connected with the milk trade could dilate eloquently on the losses incurred through milk being carelessly handled at its source and badly cooled afterwards. Thousands of gallons are yearly wasted by neglect on the part of the producer, and since the war commenced losses due to this cause have greatly increased. All milk intended for direct consumption should be produced under cleanly conditions, and immediately and carefully cooled before dispatch by rail. During October of 1916 the waste of milk arriving in a sour condition was serious, and even at the present time, if a warm day or two comes along, there is certain to be much loss through sour milk.

As regards buttermaking the causes of waste are numerous, but can nearly all be avoided.

Cream carelessly cooled during hot weather produces a butter of very inferior quality, and a large proportion of the valuable fats pass off in the buttermilk. In winter bitter and so-called "turnipy" flavours are brought about by allowing cream to stand and ripen for a long period at too low a temperature.

Frothy cream, entailing great waste of time in churning, is chiefly due to improper ripening or contamination of the cream. This also entails a serious reduction in the selling value, as the produce of frothy cream is usually of bad flavour and pale in colour. Over-ripening of cream is also responsible for serious waste of good material. Such cream produces butter soft in texture and of bad-keeping qualities. If, on the other hand, the cream be under-ripened, then in the process of churning all the butter fat is not recovered, and serious waste ensues.

Carelessly salted butter is usually streaky and unsightly in appearance, and reduced in market value. There are also other sources of loss almost too numerous to particularise, but attention may usefully be drawn to the loss of fat which often occurs in the separation of the cream from milk. If milk is passed through the separator at too low a temperature, then considerable amounts of fat are left in the separated milk. Should the separator be driven at too low a speed, then there is further waste of butter-fat.

Buttermaking to many may appear a simple process, but this is really not so. Care needs to be taken in every direction if the best results are to be obtained. Even with pork at its present high price, it scarcely pays to feed pigs with buttermilk which contains an excess of butter-fat of the value of 2s. per lb.

The waste of food material during cheesemaking is often considerable, but may easily be avoided.

To get the best results milk should be properly ripened before rennet is added. If milk is under-ripened in the earlier stages, then the process is slow, and the resultant cheese ripens badly, has a tough texture, and finally takes on a bad flavour. On the other hand, should the milk be allowed to get over-ripe or too sour in the process of manufacture, much of the fat passes off in the whey and is practically lost. Cheeses made under such conditions are gritty and hard in texture, and of greatly reduced commercial value. There is also serious waste of good feeding material if the curd is carelessly handled or subjected to rough usage. Further, if the curing room is kept at too high a temperature, excessive loss occurs of fat and of essential moisture, and a cheese of depreciated value is the result.

Many other sources of loss will also be apparent to the trained and careful cheesemaker. The whole success or otherwise of a dairy is bound up with the person who actually handles the milk.

Much waste of good food material is caused through lack of knowledge; much loss is due to sheer carelessness. It is urgently incumbent on all engaged either in the handling of milk or in the manufacture of milk products to earnestly concern themselves both with the avoidance of waste and the conservation of home products, which are essential to our welfare at the present time.

CONTINUOUS CROPPING AND DAIRY FARMING.

By T. WIBBERLEY, N.D.A., N.D.D.,
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A New System of Arable Farming.—During the past 12 years or so the problem of the cheaper and greater production of milk, beef, mutton, and pork, has practically engaged the writer's whole attention.

Starting off at the commencement of his investigations with the recognition of the fact that an acre of tilled land would produce more food for live stock than an acre of grass, he has devised a system of arable farming for the purpose indicated, regarding which the claim is made that the system is far better suited to the climatic and labour conditions which at present obtain, than is the ordinary system of tillage.

In support of this claim it is necessary to remind the reader that the present system of arable farming chiefly consists of corn and root growing, and is based upon the Norfolk system, devised about 180 years ago by Lord Townshend. In the writer's opinion, this system is by no means suited for general application in these countries.

With this latter statement the average farmer will agree, and has shown his agreement in many cases by allowing his tillage land to go to grass. This diminution of the tillage area during the last generation or so has been far greater than many people are aware of. In the 10 years' period from 1903–1913, the decrease of arable land in Great Britain has been over 1,000,000 acres, whilst in Ireland during the same period nearly 100,000 acres of plough land have been turned to grass.

Causes of Tillage Decline.—In advocating a revival of tillage farming for the production of food for direct human consumption, or, as in the present instance, with a view of increasing the output of milk or milk products, it is necessary for us to examine the causes which have contributed to the decrease of arable farming. On this point, the writer holds strongly to the view that the factors of climate and labour are chiefly responsible for the spread of pastoral farming.

Climate and Labour Difficulties.—As regards labour, it is necessary to bear in mind that for the last generation or so the farm and the factory—meaning by the latter term all industrial and manufacturing industries—have been in direct competition for the labour supply. In other words, the rate of wages, say, on a Westmorland farm is not controlled by the wages paid to agricultural labour in Cheshire, but by the rate of wages paid by the colliery and mill owners of Lancashire and the captains of industry in manufacturing centres.

Now in industrial occupations it does not matter what weather conditions may be. Neither rain, hail, snow, nor sunshine causes one

yard less cloth to be made in the mill, one ton less coal being brought to the pit mouth, or one rivet less being driven in the side of a ship. In short, irrespective of weather conditions, in industrial life every work day is an *effective* work day. It is not so on the farm. A shower of rain may not only cause the whole staff of men and horses to cease work, but may, and often does (as in the case of, say, tilling land in spring time), result in the work which has already been performed having to be repeated. Again, heavy rain at harvest—the practical tillage farmer can quote numerous instances—may often result in the partial or entire loss of farm crops.

On this point the theoretical farmers—and what a fine crop of them the war has produced—who are at present advocating a revival of tillage farming on ordinary lines, need to keep in mind that the war has greatly increased the labour difficulty from the farmers' standpoint. In the future, we may expect just as keen a competition between farm and factory for the labour supply as we have had in the past. This competition is a matter which we farmers must be prepared to face, and the only method by which this is possible is to run our farms as far as we can on factory lines. In the latter statement the whole gospel of continuous cropping is contained.

Before proceeding to describe the system in detail, we can spend a little time to advantage in further discussing the climatic difficulty. The ordinary system of tillage usually followed in these countries is the Norfolk Four Course System, or some modification of it. This system consists of corn and root growing, and it is important to note that the system was started at a time when farm labour was both cheap and plentiful, when casual labour could be obtained for the asking, and in a part of the country—the Eastern Counties of England—where the annual rainfall is from 20 in. to 25 in., whereas in other parts of these countries the average annual rainfall is as follows:—

| | | | | | |
|---|-----|-----|-----|-----|----------|
| England generally | ... | ... | ... | ... | 33·4 in. |
| England, excluding the Eastern Counties | ... | ... | ... | ... | 36 in. |
| Ireland | ... | ... | ... | ... | 40 in. |
| Scotland | ... | ... | ... | ... | 45 in. |
| Wales | ... | ... | ... | ... | 46·9 in. |

Further, under a corn and root growing regime, at least 80 per cent. of the tillage operations are confined to a brief period during the months of February, March, and April, and again the harvesting and saving of the crops under this system are also crushed into a 10-week period, say from mid-August to November 1st. These two periods, over a large area of these countries, might well be described as the rainy seasons; and the average farmer who attempts corn and root growing on anything approaching an extended scale, generally spends his time at the two periods referred to between trying to till or save crops and "tapping the glass." Even if the weather conditions in spring and autumn are favourable, there is a big rush of work at these periods. In other words, there is not that even distribution of horse and man labour to enable a farmer to successfully compete with the factory.

Conquering the Climate.—Climate we cannot alter, but we can very materially alter our system of tillage to better fit in with the climatic conditions which do exist, than does the present system. Nay, more, we can till land in such a manner that the climatic conditions, which at present retard, will greatly facilitate tillage operations. We can also till land in such a manner that, unlike the ordinary system, the land is never idle from the beginning to the end of the rotation, and eliminate to a large extent the costly hand labour which is necessary for root growing. How this is possible may be best explained by studying a continuous cropping rotation in detail.

Before setting down this rotation, it may be explained that prior to the war the writer had devoted all his attention to the growing of forage and fodder crops for conversion into milk, beef and animal products generally. The area under corn was reduced to a minimum, just sufficient corn being grown to provide grain for horses and pigs and litter for farm animals. Most of the writer's practical work has been done in Ireland, where—as is the case in many parts of Great Britain—climatic and labour conditions are distinctly unfavourable to corn and root growing, and distinctly favourable to grass growing, which, let it be specially noted, means distinctly favourable to the growing of dense crops of fodder and forage. Since the war has commenced, the area under corn on the writer's farms, and those cropped under his direction, has been increased, but, as will be seen later, the corn growing is carried out on entirely new lines.

A modified continuous cropping rotation at present followed out by the writer is as follows:—

First Year.—Summer sown corn, followed by—

Second Year.—Tares sown in autumn, hayed or ensiled in June and immediately followed with “winter greens.”

Third Year.—Half winter green “break” cropped with potatoes and a few mangolds, remaining half with flax.

Fourth Year.—Early winter sown corn on the writer's farms, with “seeds” sown following spring.

Fifth Year.—Seeds for soiling, ensiling, or haying, according to circumstances.

Sixth Year.—Seeds grazed.

To discuss this rotation in detail: The second year's “seeds”—the sixth break of the rotation—is ploughed up during summer. The ploughing and sowing may be done in late June, July, or August, depending entirely on the weather. For the ploughing of lea land in summer rain is essential, and this gives an opportunity of illustrating how what are at present adverse climatic conditions may be turned to advantage. The very rain that hinders our hay and corn harvesting operations, makes it possible to plough and sow the lea. We work on the principle expressed in the formula: “The rain that stops the reaper starts the plough.” Under the old system the rain that stopped the reaper stopped the work, or rather started the white-wash brush. White-washing being a favourite fill-up job during such slack periods.

Spreading out the Harvest is spreading out the Risks.—Now corn sown at the time referred to will ripen quite a month earlier than that sown in spring time, but not only is it possible to ensure an earlier harvest, but by a very simple process the cutting and saving of the corn crop can be extended over a three or four-week period, instead of being confined to a few days. Spreading out the harvesting operations means also spreading out the risks.

The method adopted to secure an extended harvest is to graze down the crop in sections in late autumn and early winter and part again in spring. The first grazing down with early-sown corn is essential, otherwise the crop would be killed with frost.

The harvest is not only earlier as a result of early sowing, but it can be cut under better weather conditions, there being less rain, more sunshine, lighter dews, and longer days from mid June to the end of July than from mid July to the end of August. Further, the operation of carting home the crops and the subsequent cultivations of the stubbles, under the system referred to, are conducted also over an extended period and much earlier.

The kind of corn sown under this system is also varied according to circumstances. In a wet summer the area ploughed and ready for seeding will be considerable by, say, the 1st of August. Up to that date the variety of corn sown is rye. Rye, of course, from the standpoint of grain, is not as valuable as other cereal crops, at least when both are sown in the ordinary way, but considering the greater amount of forage which rye, when sown in the manner described, yields in comparison, it proves more valuable than other cereals. All land ready for seeding from August 1st to the 31st is sown with winter tawny oats, and after that date wheat is generally sown.

The Tare Crop.—As the different sections of corn are harvested and carted, the stubble is broken up and sown with tares, a mixture of winter vetches and winter cereals. Care is necessary in sowing the crop to see that too great a proportion of vetch is not included in the seed mixture, as otherwise great trouble in cutting and saving the crop will be experienced. A suitable mixture is 5 to 6 stones (of 14 lbs.) winter vetch, 4 stones winter wheat, 4 stones winter oats. This crop is cut for hay or ensilage in the following June, the latter being made during unsuitable hay weather.

The "Winter Greens."—This term is used in a generic sense to indicate the several forage crops which are sown from July onwards on the vetch stubble. These "winter greens" chiefly consist of marrow stem kale, Labrador kale, thousand-headed kale, giant rape, hardy green turnips, rye, mustard, &c. All these crops are usually broadcasted. By this means the laborious and costly process of singling and hand hoeing, such as is necessary with roots, is avoided. These crops are all very rapid growing crops, in other words, weed smotherers. This brings us to one of the most important features of the continuous cropping system. Once a continuous cropping system has been established, the cleaning of land by hand labour is no longer necessary. It is where crops are poor that weeds make the

greatest headway, and it is when left without a crop as is usual in autumn, winter, and spring under the ordinary system of cropping, that weeds become established in land.

Potatoes, Mangolds, and Flax.—The winter greens provide succulent green feeding from October to March and April. Then the land is tilled up, half planted with potatoes and a few mangolds and the rest sown with flax.

One Crop Dries the Land for the next.—These crops, of course, are sown in spring; are, in fact, the only spring-sown crops. There is, however, a very big difference between sowing and cultivating one-fifth of the tillage crops in spring rather than 80 per cent. of them, as is usual with most ordinary rotations. There is also another very important difference. A dense forage crop, say of giant rape, is capable of ridding the land during its period of growth, by leaf transpiration and root action, of the equivalent of about 12 inches of rainfall, so that land so cropped during the winter period is in a far drier condition than land left idle, as is the case when potatoes and roots follow a corn crop.

As regards flax, it is not, of course, recommended that the British dairy farmer should undertake the growing of this crop, valuable as it is. The writer is simply describing a rotation which he himself follows on a dairy farm in the North of Ireland, and endeavouring to indicate—it is very necessary to emphasise this point—how each farmer may modify his rotation to suit his individual circumstances. Instead of growing flax, the whole area could be sown with potatoes, mangolds, or other root crop; or in districts where labour is scarce, or a market lacking for potatoes, the winter greens could be followed either by an ordinary spring-sown corn crop, with which seeds could be sown, or the rotation shortened by a year, and tares and seeds sown after the winter greens instead of in the autumn after the potatoes, &c.

Tares for Autumn Soiling.—The idea of growing a second crop of tares in the rotation is to provide summer soiling for dairy cows. This feature of the continuous cropping system is all important for the dairy farmer especially. One acre of such a soiling crop as tares provides, will produce more than three acres of similar land in pasture. This means, in practice, that the farmer, who at the present time is depending on pasture for the summer feeding of his dairy and other stock, can carry the same amount of stock on half his usual pasture land by supplementing same with soiling crops. In the case of a small dairy farmer, he could dispense with pasture entirely, and feed his stock wholly on soiling crops. The latter is the system in vogue in continental countries, where dairy farming is followed. Did space permit, the writer could cite numerous cases, where many farmers in Great Britain and Ireland who have adopted this system have been able to double not only the stock carrying capacity of their pastures, but the stock carrying capacity of their entire farm. One such case is worth quoting. At Menahela Bridge, Co. Limerick, there exists a co-operative creamery, consisting of small farmers who may be said to produce practically nothing but milk for sale to their creamery. A few years ago these farmers, as is the case with most dairy farmers, produced all their milk

from pasture land, supplemented with purchased cakes and meals. It is scarcely necessary to point out that the co-operative effort of this body of farmers was entirely due to the work of the society for the propagation of co-operation, founded by Sir Horace Plunkett, to whom it may be here stated the writer is greatly indebted for the great and generous help which Sir Horace has given to him, and which has largely contributed to the great headway which in recent years continuous cropping has made.

The Menahela Bridge Society in 1912 decided to extend its operations, and to take up what Sir Horace Plunkett has termed "Wibberleyism" (continuous cropping and the co-operative use and purchase of farm implements). The result is briefly set forth in a letter written by the manager of the society to Sir Horace Plunkett, in which the statement is made, "As a result of our farmers taking up continuous cropping, and applying co-operation for the purchase and use of farm machinery, the milk supply to our creamery has in two years increased from 188,000 to 317,000 gallons."

It may be added that Menahela Bridge is situated in a cold, wet, mountainy district, where by all ordinary standards the land is considered wretchedly poor.

Whilst most farmers at one time or another have used at least a small area of forage crops as soiling, it is not generally known what an enormous yield of such crops can be obtained from land by improved methods of cultivation, and how much the labour of soiling can be reduced by a little thought. As to the former, it is generally believed that such "annual" crops as tares, rape, kale, &c., only yield one crop, but by cutting the crop so as to leave a high stubble, say 6 inches, and above all keeping the land well supplied with fertilising elements, two or three crops can be cut in the year. For instance, the tares sown in the fourth year of the rotation described are first grazed in sections during May to about mid June, then the different sections are cut from mid June to about August the 1st, and again cut from August to about mid October.* The object of first grazing in sections is to ensure the second growth of the different sections being ready for use at different periods. Where the soiling system is carried out in conjunction with pasturing, from one to two acres of soiling crops per month—depending on the amount of pasturage allowed—will be necessary for every 20 dairy cows.

The old system of using soiling crops was to cut the crop, generally with a scythe, cart it home, and feed it to the stock in the houses. Except on small farms this system, because of the labour required, is not practical. Not only has the crop to be carted to the house, but the manure carted back and spread, and further, since cattle won't eat soiling when it has been "blown on," soiling in the house means feeding the cattle five or six times in the day.

The writer has devised a system of movable fences, so that the labour of carting is reduced to a minimum. This system is fully

* See Special Leaflet 65: "Continuous Cropping." By T. Wibberley. Supplied free by the Board of Agriculture and Fisheries.

described elsewhere.* The movable fence may not always be practical, but where it is not, then it is far better to feed the soiling crops on pasture land; adjacent to the field where the crop is growing, if possible.

Winter Soiling. The "Winter Greens."—The "winter greens" grown after the vetches in the second year's break will be ready for consumption about October, and can during a fair proportion of the winter be either fed out on pasture land, in some cases actually folded on the land by use of the movable fence, or since these crops do not wilt or ferment, during the winter months can be fed inside the house. The feeding of winter greens, however, cannot be done during prolonged frost or very wet weather. During such periods the cattle can be fed on the tare or seeds ensilage or on the few mangolds grown in the third year of the break.

More Weatherproof Farming.—Ensilage gives another example of turning what otherwise would be unfavourable weather conditions to advantage. It is made in weather unsuitable for hay-making. There is, of course, more labour in making ensilage than in making hay; but the very wet summer months, which cause us to make ensilage, make the tilling of the tare stubble on which the ensilage has been grown all the easier. In short, wet weather in June or July means in practice that the ploughing of the tare stubble is not necessary. All the cultivation can be done by the disc harrow, the cultivator, and spring time harrow, and done at a very quick rate. On this latter, one man with a three-horse team operating the implements mentioned can complete the cultivation of $1\frac{1}{2}$ acres per day of a tare stubble for seeding down with "winter greens." This means that the cultivation of the crop only costs about as much as the singling out of an acre of roots, which these "winter greens," in conjunction with ensilage, are intended to replace.

To many farmers who remember the way ensilage was boomed some years ago the very mention of the word is anathema. But there is ensilage and ensilage, and the ensilage which now can be made on the improved tower silo system, or the new stack ensilage devised by the writer† and described elsewhere, is quite a different thing to the horrible smelling stuff which was made when first the ensilage system was introduced.

The Root Question.—As to the question of root growing, on anything of an extended area, for either milk or meat production, bitter years of experience have taught the writer to regard roots as "the root of all evil" from the tillage farmer's standpoint. It is all very well for people to sit down and make estimates as regards the growing of roots, and show a handsome profit. These estimates include detailed accounts of the *actual* amount of horse and manual labour

* Booklet, "War-time Farming," 6d.; or book, "Continuous Cropping and Tillage Dairy Farming," 2s. 6d. Published by C. A. Pearson, Ltd., Henrietta Street, Strand, W.C. 2.

† See Books mentioned previously, also article on Sweet Stack Silage by the writer in Board of Agriculture Journal for September, 1916.

expended on the crop, and such accounts are all very well so far as they go. They seldom, however, keep any account of the number of days that both men and horses, through bad weather conditions, cannot get near the crop, or refer to the great difficulty of now getting sufficient casual labour for the singling out and after cultivation of the crop, or state that such labour, even when obtainable, is often not worth the getting. Neither is the fact referred to that, due to one pest or the other, roots, particularly turnips, are the most difficult crop to grow; nor that between the clearing of the land in the previous autumn and the sowing of the roots in the following May or June the land is without a crop.

The Elasticity of Continuous Cropping.—As will be seen by a study of the literature on the subject, the system of continuous cropping is very elastic. Tares intended for hay can in wet weather be converted into silage, as also can any surplus of crops intended for summer soiling. If in a dry summer the area under soiling crops proves insufficient, forage crops originally intended for haying or ensilage can be converted into soiling. It often happens, especially with dry stock and sheep farming, that in a bad grass season the pastoral farmer is compelled to sell his stock when prices are down, because he has not sufficient grass. With a reserve of forage crops on hand he can, under such circumstances, keep his stock on, and often sell under much more favourable conditions. The elasticity of the system is most marked however when one comes to consider the question of crop rotations. It will then be found that at least two dozen different rotations are possible, each suitable for a different style of stock farming, marketing, climatic, and labour conditions.

On this latter point the writer would like to say a few words. During a recent lecturing tour throughout the whole of England and Wales, undertaken under the auspices of the Agricultural Organisation Society, a very large number of farms were visited, the owners of which had begun to adopt the continuous cropping system. In the majority of cases there has been too much adherence to the particular rotations which the writer himself follows, or those he has mentioned in his writings on the subject. Each farmer must endeavour by a study of local conditions to plan out a rotation for himself. He must also ascertain by trial and observation what are the most suitable kinds of forage crops and the rates of seeding for his particular farm.

Cheaper Milk Production.—Space does not permit of giving much detailed information on these points, but one matter which deserves great attention at the present time is the economy of milk production which can be practised by adopting the continuous cropping system.

Milk production on the average British farm is at present dependent on grass land and foreign cakes and meals. The average dairy farmer pays one rent to the landlord and three or four rents to the cake merchant! It is well known that grass as pasturage, except for a very brief period in early summer, or grass as hay, supplemented by roots, straw, &c., does not contain sufficient albuminoids or protein

for the economical production of either milk or meat. Therefore most artificial foods which the farmer buys are of an albuminous nature—cotton, earlnut, linseed cake, &c.

By growing the crops mentioned the amount of foreign albuminous food can be reduced to a low minimum. Such foods may in fact be dispensed with. For instance, a winter dairy cow yielding 3 gallons of milk per day would be considered to be well fed on a daily dietary of $1\frac{1}{2}$ stone meadow hay, 4 stone of swedes, 3 lbs. of decorticated cotton cake, and 3 lbs. of maize meal. We can set out the digestible protein and starch equivalent of this ration in the following manner:—

| RATION No. 1. | | | | Digestible Protein in lbs. | Starch Value in lbs. |
|---------------------------------|-----|-----|-----|----------------------------|----------------------|
| $1\frac{1}{2}$ stone meadow hay | ... | ... | ... | ·84 | 6·51 |
| 4 stones swedes | ... | ... | ... | ·14 | 3·92 |
| 3 lbs. decorticated cotton cake | ... | ... | ... | 1·02 | 2·13 |
| 3 lbs. maize meal | ... | ... | ... | ·21 | 2·52 |
| Total | ... | ... | ... | <u>2·21</u> | <u>15·08</u> |

* Now the following ration is richer in digestible protein, and has practically the same starch equivalent as the preceding one:—

| RATION No. 2. | | | | Digestible Protein in lbs. | Starch Value in lbs. |
|--------------------|-----|-----|-----|----------------------------|----------------------|
| 1 stone vetch hay | ... | ... | ... | 1·44 | 4·18 |
| 1 stone meadow hay | ... | ... | ... | ·55 | 4·24 |
| 6 stones rape | ... | ... | ... | 1·26 | 6·72 |
| Total | ... | ... | ... | <u>3·26</u> | <u>15·14</u> |

In theory the second ration, *composed entirely of food grown on the farm*, is slightly better than the first, which contains 6 lbs. of foreign, and at the present time, very high-priced food. In practice, over an extended trial carried out by the writer, the second ration proved to be slightly better than the first. In the case of a dairy cow giving, say, 4 gallons of milk per day, it would not suffice to increase the quantities of the different foods contained in No. 2 ration. The ration by so doing would be too bulky. In order to make the ration suitable it would be necessary to increase the albuminous fodder (vetch hay) and reduce the ordinary hay, and give a little home-grown trough food, in the form of grain. For instance, the ration might be modified as follows:—

| RATION No. 3. | | | | Digestible Proteins in lbs. | Starch Equivalent in lbs. |
|---|-----|-----|-----|-----------------------------|---------------------------|
| $1\frac{1}{2}$ stone vetch and cereal hay | ... | ... | ... | 2·17 | 7·77 |
| $\frac{1}{2}$ stone of meadow hay | ... | ... | ... | ·28 | 2·17 |
| 6 stones rape | ... | ... | ... | 1·26 | 6·72 |
| 3 lbs. crushed oats | ... | ... | ... | ·27 | 1·89 |
| Total | ... | ... | ... | <u>3·98</u> | <u>18·55</u> |

About the month of July the dairy farmer, in order to keep up his supply of milk, as a rule finds it necessary to give his dairy cows albuminous food, generally in the form of decorticated cotton cake. Three lbs. of this foodstuff supplies 1·02 lbs. of digestible protein, and has a starch value of 2·13 lbs. Four stone of mixed oats and vetches as green soiling would supply 1·12 lbs. of digestible protein, and would have a starch equivalent of 4·48 lbs.

Owing to the high albuminous contents of the foods grown under the continuous cropping system, and the comparatively low cost of the production of these crops, the writer has no hesitation in stating that it is possible to produce meat or milk, so far as the cost of food is concerned, on these crops at at least 40 per cent. less than would be the case with either grass or ordinary farm crops, and the necessary complement of purchased feeding stuffs. On one farm of about 380 statute acres, where practically everything grown is converted into finished beef and mutton, we have sold approximately £5,200 worth of these products in the current year, whilst the cost of purchased food for same was approximately £80. Were it not for the fact that practically all the beef was shipped from Ireland to England (and thus necessitates some astringent food—undecorticated cotton cake—being fed to the cattle for a short period before transit), expenditure on foodstuffs could be practically dispensed with.

A table† showing the high albuminous character of several types of continuous crops in comparison with ordinary crops is here appended :—

| Food. | Total Percentage. | | | | Digestible Percentage. | | | Albuminoid Ratio. | Starch Value. |
|-------------------------------|------------------------------|------|----------------|--------|------------------------|------|------------------|-------------------|---------------|
| | Crude Protein (Albuminoids). | Oil. | Carbohydrates. | Fibre. | Protein (Albuminoids). | Oil. | Carbohydrates. † | | |
| Vetch and Cereal Hay, | 13·38 | 1·5 | 42·1 | 27 | 10·35 | 1 | 41·4 | 1 : 4·2 | 37 |
| Vetch, Cereal and Bean Silage | 3·92 | 1·25 | 10·5 | 10·25 | 2·95 | ·75 | 12·5 | 1 : 4·8 | 10·5 |
| *Rape ... | 2·75 | ·75 | 6 | 3 | 1·5 | ·5 | 6 | 1 : 5 | 8 |
| *Meadow Hay | 10 | 2·5 | 42 | 26 | 4 | 1 | 41 | 1 : 11 | 31 |
| *Swedes ... | 1·25 | ·25 | 8 | 1·5 | ·25 | ·1 | 8 | 1 : 33 | 7 |
| *Mangolds ... | 1·25 | ·25 | 9 | 1 | ·1 | ·1 | 9 | 1 : 92 | 7 |

* The figures relating to these foods have been reproduced from Professor Crowther's table published by the University of Leeds, to enable comparisons to be made between meadow hay, oat, and cereal hay, and also between swedes, mangolds, and the substitutes for roots (silage and rape).

† Includes digestible fibre.

‡ Board of Agriculture Special Leaflet 65, "Continuous Cropping."

THE POLITICAL ASPECT.

By SIR HERBERT MATTHEWS.

PART I.

PROGRESS OF BRITAIN AND GERMANY COMPARED.

MR. MIDDLETON'S report, prepared at the request of Lord Selborne when he was president of the Board of Agriculture, and since issued as a Government publication, has produced perturbation in many quarters. It has caused the Council of the British Dairy Farmers' Association to ask the question—Why, if the German dairy industry has been able to accomplish what is stated in this report, has the British dairy industry failed to make similar progress, and how far, and by what means may that be remedied in the future? In endeavouring to elucidate this problem it has been divided up into compartments, and the section dealt with here is the Political Aspect of the Problem.

There are few words more misused or misunderstood than this term "political;" but here it is understood in its original and proper sense, as "the art or science of government." It is taken to include the political economy of the industry, and that, of course, means travelling over the whole field, for political questions are involved in almost every phase of the subject.

There is no single answer to the question asked above. The fact that Germany has outstripped Britain, not only in the dairy industry, but in other branches of agriculture, and indeed in most phases of human activity, is due to a variety of causes. These act and re-act on each other, so that they cannot be dealt with in water-tight compartments.

EDUCATION.

Probably the most far-reaching factor is that Germany is more than a generation ahead of us in both elementary and technical education. The immediate result of her advanced education is that her farmers read. Not only do they read, but their minds are trained to receive impressions, and to adopt any new methods which promise better results than those they have hitherto followed. Many of our farmers read practically nothing, and a very large number of them are firmly convinced that books and science can teach them nothing. This does not, of course, apply to the elect few. Luckily we have a percentage who can give a lead even to Germany, but it does apply to the average. Take, for instance, the question of milk records. This is no new proposal, for the writer was keeping such records as far

back as 1888, and proved their value to be incontestable. How many miles of print have been used since then urging a general adoption of this method? Yet even to-day but a small proportion of dairy farmers will take the trouble. Why is this? It is either because they do not read, or, if they do, they are not open to receive impressions.

Germany uses double the quantity of artificial manures per 100 acres that we do, and to quote Mr. Middleton, "the chief factor in developing the use of artificial manures in Germany was unquestionably a well organised system of technical education." On the other hand we use 11.5 tons per 100 acres of imported feeding stuffs to their 8.7 tons. Theoretically this should compensate for the smaller quantity of artificials used by us, but, owing to the heavy losses which occur in farmyard manure through improper storage, this deficiency is not made up. Either our farmers are not sufficiently educated to know that he loses the benefit of this extra bulk of feeding stuffs by bad management of his farmyard manure, or he is too careless to prevent this loss. The German is taught to know the real value of such artificials as he purchases, and to apply it properly; therefore, in addition to buying more, he uses it to the best advantage. Our farmers, unfortunately, are frequently inveigled into buying almost worthless manures, because they are offered to him by unscrupulous dealers at a low price. He thinks he is buying something cheap, whereas if he were properly educated he would know that low prices and cheapness are by no means synonymous terms. Fertilisers and Feeding Stuffs Acts cannot be framed to protect men against their own stupidity.

Farmers have frequent reason to complain of acts, either of omission or commission on the part of the Legislature, but it is generally their own fault if their views do not receive proper attention. They do not read, and consequently they only begin to realise what is happening when it is too late to take action. They blame the British Dairy Farmers' Association, or the Central Chamber of Agriculture for inaction, if and when they discover that something detrimental to their industry has happened, but if they were educated properly they would realise that it is their business to know what proposals are on foot, they would recognise that societies are only as strong as their members make them, and that collective action is necessary if it is to be effective. The German farmer being better educated created an agrarian party 25 years ago and "The Party of the Plough" as it is called, has since then been a force to be reckoned with.

ARABLE *versus* GRASS.

Germany has only 32 per cent. of his 100 acres under grass; we have 69 per cent. Therefore, he grows a larger proportion of his own feeding stuffs, and keeps more stock per 100 acres than we can. This gives him more farmyard manure for his land, and this in turn produces more luxuriant crops.

LAND TENURE.

Germany has solved the problem of land tenure by practically abolishing it as a problem, for 93 per cent. of her agriculturists own the land they cultivate, whereas in England and Wales only 11 per cent. of the occupiers are owners. There is no waste of time and effort in debating questions of fixity of tenure, systems of cropping, compensation for disturbance, or scales of compensation for unexhausted improvements. Nor is there such a waste of substance there as the constant changes of tenancies involve in this country. It is, perhaps, impossible to estimate, but the aggregate loss caused by the number of removals from one farm to another every year would be startling if it could be ascertained. This loss is a dead-weight debt on agriculture, and is by itself enough to prevent general improvement. It does not mean only the actual expense of removal, solicitors', auctioneers', and valuers' fees, personal expenses incurred in viewing new farms, and so on, but the loss which is inevitably caused by lessened production on the part of the outgoing tenant, who naturally is not doing his best by a farm he is leaving, and the further loss incurred by the incoming tenant, who has to learn the capacity and peculiarities of his new holding. Moreover, ownership means continuous good farming, and it creates more enthusiasm and energy than is possible under any other conceivable system of tenure. All this applies equally to both large and small holdings.

There is an old saying, current among farmers, before fire insurance became general, that "three moves were as bad as a fire."

GERMAN ECONOMIC POLICY.

Mr. Middleton says in his report—the organisation of German agriculture is intimately associated with her general economic policy. He does not, however, accept without qualification, the suggestion often put forward that progress in German agriculture and retrogression in British farming may be explained by the fiscal policies adopted by the respective countries. He admits that the fiscal policy has affected the conditions, but the precise manner in which tariffs have contributed to its prosperity is difficult to discover. Later in the report we are told, however, "it was not the tariff but the policy of which the tariff was an expression that vitalised German agriculture, and if the German farmer had not been assured 20 years ago that the nation was behind him, Germany could not now have maintained her people for 12 months."

And again: "The main value of the tariff policy to German agriculture was the sense of security which it created in the farmer. It was the conviction that he was essential to the community, and that the community would not permit his land to go out of cultivation, rather than the prospect of receiving an extra two marks per kilos for his wheat after the year 1906 that stirred the German agriculturist of the new century to make an effort; and, it may be added, it was the knowledge that his grain was not wanted and that his fellow

countrymen did not depend upon his exertions that led the British farmer, at this same period (between 1894 and 1906) to cut down expenses and reduce, or at least fail to increase, the productivity of his land."

During the same period our farmers were constantly being told that if they were not able to grow our produce as cheaply as it could be imported they could go. The British farmer was not wanted. All necessities of life could be imported. Our land bore an unfair and heavy burden of rates; our railways granted preferential rates to imported produce; fraudulent competition was allowed to go unchecked, and adulteration was rampant; while in more recent years the general tendency of the political world has been in the direction of making the farmers' position insecure.

There is a belief, fairly generally held by graziers and dairy farmers, that the imposition of tariff duties would be of no advantage to them, and the principal reason for this belief seems to be that they might have to pay higher prices for the feeding stuffs they consumed. This theory rests on very poor foundations.

Of course, if the single point of the imposition of a duty on corn be taken alone, and every other factor is assumed to remain unchanged, there may be something in it, though even that is arguable. For a duty on corn, if enough to make corn-growing profitable, and if fixed for a sufficiently long period of years, will make it profitable for the farmer to cultivate land rather than to keep it under grass. This remark does not apply to really good old pasture, but it does apply to half or three-fourths of the four million acres that have tumbled down to grass since 1880. Arable land will carry more stock (*i.e.*, it can produce more meat and (or) milk) than the same area of grass. The farmer can then follow the German example and grow more of his feeding stuffs instead of purchasing them, and he can certainly grow them cheaper than he can buy them. He will also have all his best corn to sell.

To follow this argument to its conclusion would be to trespass on one or more of the compartments allocated to other writers, but for a full and scientific statement on the matter readers are referred to the paper read by Mr. Middleton before the British Association, and printed in the *Journal of the Board of Agriculture* for September, 1915.

In endeavouring to ascertain the effect of duties, however, many other points must be taken into consideration. A properly balanced fiscal system must include duties on imported meat and dairy produce. The dairy farmer would therefore obtain direct advantage in that way. A scientific tariff law must put a heavy export duty on all millers' offals, and a heavier import duty on flour and meal than on grain, thus ensuring the milling being done in this country, and the quantity of offals increased. These two items would *reduce* the price of this class of feeding stuff. Dairy farmers would have to be on their guard lest they be induced into buying patent feeding cakes, or other manufactured foods consisting mainly of such offals, at twice their value.

This is a form of adulteration not altogether unknown ; but the farmer who knows his business can protect himself against this kind of fraud.

A general increase in the area of arable land should mean that dairy farmers will be able to realise better prices for young store stock, and if they would breed a better quality of calves this would mean an appreciable item in the balance sheet. With the aid of the Government's Live Stock Improvement scheme there is no excuse for anyone to breed such inferior calves as many that are now offered for sale.

The theory so often held—and acted upon—that a dairy farmer cannot breed his dairy cows so well as he can buy them is merely evidence of a lack of education. This system of purchasing means unnecessary dealers' profits, unnecessary railway journeys and railway charges, waste of time for both master and man in attending markets, and the risk of bringing disease on to the farm with every purchase. The policy to aim at should be to retain those calves that are bred from heavy milking strains, and sell the rest.

It may be claimed that Germany's fiscal policy induced her farmers to keep their land under the plough. At any rate, during the period of depression our farmers converted nearly four million acres into so-called pasture, while the Germans kept up their arable area. Not only this, but they increased the average cereal production *per acre* by about 70 per cent. During the same period they increased their production of meat, poultry, and dairy produce per acre, especially milk, which Mr. Middleton now estimates at 28·1 tons against our 17·4 tons per 100 acres.

In an article published in 1910 on "The Effect of Tariff Duties on the Dairy Farmer," the present writer urged these arguments, and stated as an axiom—"Provided that all produce can be sold at a profit (*i.e.*, that the price realised is higher than the cost of production) the greater the output of crops or stock the better it is for the producer."

In order to obtain a greater output land must be cultivated as arable, not as grass.

It is gratifying to find that one's view has been proved so correct as Germany has shown it to be.

This disposes of the theory that the loss this country has incurred by reducing her output of cereals has been made good by an increased production of meat and dairy produce. The increase in our herds and flocks is due in much greater degree to the legislation dealing with diseases of animals than by our changed system of farming. It would have taken place in any case. In fact, it is contended that the increase would have been even larger than it is had this conversion to grass never taken place.

LABOUR AND WAGES.

It is impossible to state in a few words how the rate of wages in Germany compares with Britain. As may be gathered from the wide variations in England alone, the variations are wider still in the much larger area covered by the German Empire. The extensive forest area in the latter introduces a further complication, as numbers of

people engaged in forest work during the winter are employed in agriculture for the rest of the year. These may, or may not, be classed as agriculturists in the official returns. In many districts wages in Germany are chiefly paid in kind, and the value of such payments is extremely difficult to determine. So far as Mr. Middleton's figures go one is led to the conclusion that although (with a few exceptions) the average German farm hand has earned considerably less per annum than the British agricultural labourer, the German farmer employs a larger number, and his outlay for labour per acre has been appreciably more than his British competitor has spent. It is no doubt largely due to this fact that the German has been enabled to increase the average production per acre.

One point is clearly established, and that is that there has been a steadily progressive increase in the rate of wages in Germany since 1875.

SUGAR BEET.

There are numerous references to the cultivation of sugar beet in the report we are considering. Information collected from other sources, and from France, Belgium, Holland, and Denmark, as well as from Germany, confirms the truth of the following quotations from Mr. Middleton's memorandum:—

"The intense and intelligent cultivation required by the beets proved everywhere an advantage for the other branches of agriculture."

"It has necessitated deep cultivation and heavy manuring, with most beneficial results to succeeding crops; the beet growers have been the pioneers of improved farming in many parts of Germany; the residues from the crop have been skilfully used for cattle feeding, and animal industry has flourished where sugar beet is grown; finally it is recognised as the crop which produces most human food per unit of area . . . Without it the high level to which German agriculture has attained in recent years would have been impossible."

SOIL AND CLIMATE.

We cannot claim that Germany has any natural advantages over us, for Mr. Middleton states emphatically that "the soil and climate of Germany are less favourable to agriculture than those of Britain." We must, therefore, attribute their ascendancy in food production to the "German economic policy in recent years, which has favoured agriculturists, who have benefited partly from the higher prices resulting from tariffs, and partly from the steadying effect which the known policy of the State has had upon the industry."

The general effect of this influence has been to produce a rapid improvement in the technical methods of the German farmer. Superior strains of both plants and animals have been raised, and business methods have been introduced, while rural industries, such as sugar, alcohol, starch, &c., have been developed.

The foregoing is an attempt to summarise the reasons given in Mr. Middleton's report on German agriculture.

PART II.

FUTURE POLICY.

The title of this article involves some thought for our future policy, if we are to hold our own, not merely with German, but with other competitors, and this requires a glance at a number of questions. Some of these involve legislation, though, as is well known, farmers do not want legislation. They would much prefer to be left alone. Well, there is going to be legislation, however much they dislike it. Legislation of a far-reaching, and perhaps drastic character; so it is as well that they should have some voice in framing the laws which in future will more or less affect their industry. To gain an effective voice it is necessary to be quite sure that they have made up their own minds, and have agreed to act collectively.

In trying to form any conclusions as to what is required to develop the dairy industry one must avoid the mistake of thinking of dairying only. Few branches of farming can be conducted in water-tight compartments, and a broad outlook is essential even when considering the production of only one article. If it is necessary to suggest legislative action, its effects not on one district, but on the whole country, must be held in view. For instance, the man who hires one of the small grass holdings in West Yorkshire, who has all his work done by members of his family, sells milk or butter, and a few head of store stock, will find it difficult to appreciate the need for worrying about the rate of wages paid to agricultural labourers. He will quite fail to see the need for import duties on anything he may have to purchase, though probably he would find no fault with a tax on foreign butter and margarine. One may travel for many miles in this district and never see an arable field, while probably many of these landholders (they can hardly be termed "farmers") have never held a plough handle in their lives. Compare them with the large farmers in and around the fens. As a rule these are educated men, who take a broad view of matters, and are not likely, therefore, to urge any such proposals; but if they only looked at their immediate surroundings they might well say: "Put duties on every kind of grain and seed, but not on dairy produce; allow unrestricted imports of store stock, implements, and other requisites, tax all grain offals, but not other feeding stuffs." In this latter district we find practically no grass, and hardly any breeding of stock, but large staffs of workers and all kinds of implements are employed.

Parliament cannot legislate in such a parochial way. Consideration must be more on the following lines: It is necessary for the welfare of the State to increase the production of home-grown food; there is only one way of securing increased production, and that is to make it profitable for the farmer to produce more per acre in the future than he is doing now. We cannot base any policy on certain systems of farming merely because they happen to exist; we can only consider such a policy as will insure the largest output of food.

Now to ensure success the basis of any policy having this object in view must be to give a sense of security, a certainty that, humanly speaking, the producer can count on obtaining fair and remunerative prices for his produce. It is useless and unreasonable to expect any business men to launch out in expenditure, to experiment in fresh methods, or to spend time in investigation, especially with a business which has such a slow turnover as farming, unless you give him this feeling of security. Professor Middleton tells us that it was the tariff laws of Germany that started and kept alive the energy and enterprise which brought about the amazing development of German agriculture. It may be confidently stated that such laws would have the same effect here, and that nothing else will have an equal effect. There is no necessity to ask for prohibitive duties. So long as they are systematic and continuous, and spread over a sufficient number of commodities, it is the fact of their existence that matters. Such duties must be imposed on a carefully constructed and scientific basis, not large enough to burden the consumer, but sufficient to give the home-producer the advantage. Wheat, barley, oats, and rye should all be subject to a tax; maize might be free, if imported in grain, but not in the form of meal. Meat, butter, and cheese must be included, and other crops, such as hops, fruit, flax, tobacco, and sugar require encouragement. If a comprehensive system were imposed giving, wherever possible, a preference to our Dominions and Colonies, and discriminating between our Allies on the one hand, and neutral and enemy countries on the other, no particular duty would be a burden on the general public, but the aggregate result would revolutionise farming in a very few years.

It will be observed that in the foregoing suggestions for a tariff law milk is not mentioned. Broadly speaking, under present conditions milk enjoys a greater degree of natural protection than any other agricultural commodity. Moreover, the milk producers have more or less learned the value of organisation, and because of this natural protection have been slowly enabled to force up the price. For the moment, therefore, not only do they not require any stimulus, but a request for it would certainly arouse general opposition.

How long the protection which now obtains is going to remain effective is another matter. Milk producers are now holding an advanced and protected position, but all kinds of attacks are being made upon it, and unless the weapons of their adversaries are understood, this position may either be carried by assault or undermined. There is the open attack by importation of milk; but thanks to the public objecting to preservatives in milk (although they do not seem to mind them in other articles of food), this offers no immediate danger. The day may come though when science may render it possible to ship milk for long distances, and if this happens the attack will be driven home by mere force. There is the insidious attack by means of imported condensed milk, which may come from all quarters. This may be produced under insanitary conditions over which our sanitary authorities have no control, and it may be sold to ignorant consumers

in competition with our standardised milk, though its quality leaves much to be desired. This may be called the poison gas attack.

There is the howitzer attack, from long distances, of dried milk. This form of competition has already effected an entrance, and is largely used in many manufactured foods, and if science can get over the one drawback it now suffers from it will effectually knock out the whole-milk trade. This dried milk may be either British (produced under the supervision of our local authorities) or foreign (produced with or without any supervision). There is lastly synthetic milk, a new competitor, whose strength of attack cannot yet be gauged. It may or may not become serious, but when science applies herself to any problem, it is unwise to prophesy absence of danger. Because these various competitors exist, and because it is not known how these attacks may develop, the milk producer will be well advised not to press his present advantage too hardly, for if the consumer be tried over much, he may turn for relief to some of these substitutes, even though aware of their inferiority.

MINIMUM PRICE FOR WHEAT.

Along with import duties it will almost certainly be necessary for the Government to guarantee a minimum price for wheat, at any rate for a term of years, in order to hasten the increase in the home production of bread stuffs, but it is doubtful if such a guarantee would become operative if worked in conjunction with a sliding scale of duties. Dairymen may be reminded that an increase in wheat production means an increase of other crops in rotation, all producing more or less feeding stuffs, hence the ground for their interest in a minimum price for wheat.

EDUCATION.

The need for better education in all branches of agriculture has already been touched upon, and it is only necessary to add that a complete system of agricultural colleges, farm schools, and continuation classes ought to be set up, sufficiently endowed by the State to enable pupils to be educated for moderate fees, and with a generous supply of scholarships by which the more intelligent boys and girls may pass upwards if their capabilities suffice.

OWNERSHIP *versus* TENANCY.

Every possible means should be taken to enable farmers to become owners of the land they cultivate. Compulsory sale or purchase must be avoided, but the amount of land changing hands every year is so large that there are constant opportunities of acquiring farms. Such a change must, of course, take time, but because a policy cannot be adopted everywhere, and at once, that is no reason why it should not be brought about by degrees. Sudden and revolutionary changes can never succeed in agriculture.

This matter has already been dealt with in the first part of this article, but one or two further points may be added. For instance,

the creation of one or more land banks is necessary to assist farmers to become owners on purely business lines.

There is an unwholesome fear on the part of some tenants that rents may be raised. The best preventive of this is to be your own landlord. Such a course also does away with friction arising from damage by game. This fear of higher rents implies a curious lapse of memory. In the 'sixties and 'seventies rents were double, sometimes treble, those of to-day, yet farmers then made large profits. When the depression set in rents disappeared altogether on some estates, and on many others became merely nominal, yet the total remission of rents did not make the difference between profit and loss in the cases of thousands of tenants. We want more capital in agriculture, but the capitalist can hardly be expected to invest in land as a business proposition if he is never to expect more than the nominal interest that land has paid since, say, 1890. If the present system of landlord and tenant is to continue, there must be a clearer perspective of what is fair to both these partners in the business of farming.

ADULTERATION.

This is a hydra-headed form of competition for which dairy farmers must always be on the look out. The produce of this country, with the advantages our farmers have in soil and climate, and with markets on the spot, ought always to command a sale by reason of its superior quality, provided this advantage is not filched away by fraud. Superior quality in itself encourages that other species of fraud—the sale of foreign produce as British. The suggestion has been made that we should employ some general brand, or trade mark, in order to establish the superiority of British goods, but there is a danger that the use of such a method would only simplify the operations of dealers in spurious goods; the profits accruing from this form of trading are so large, and the cases in which prosecutions could be instituted so few, that fines would merely be looked upon as an item on the expenditure side of the account. Unfortunately some kinds of produce cannot be marked, but dairy farmers should insist upon every piece of bacon, and every cheese imported into this country being indelibly marked with the words "foreign produce," or "colonial produce," as the case may be.

MILK AND DAIRIES ACT.

After years of unsatisfactory private legislation this Act has been put on the Statute Book, but owing to the war has not yet come into operation. Notwithstanding this fact, it is hardly credible, but a band of enthusiasts are amusing themselves now in preparing a further measure for regulating the conditions affecting milk production and distribution. It is to be hoped that before any one in an official or authoritative position lends an ear to such proposals the existing Act may, at least, be given a chance to prove its utility.

SALE OF MILK REGULATIONS.

Thanks to the public-spirited action of Mr. Richardson, supported by the Cambridgeshire Chamber of Agriculture, the injustice of a milk producer being prosecuted and fined for offering milk for sale presumed to be adulterated, though sold as it comes from the cow, has been settled in the High Court, and we may hope that this form of persecution has ceased. It is as well, however, not to assume too much, for almost before the ink recording this legal decision was dry a little group of medical officers of health began to agitate for an amendment of the law in order to nullify it. Parliament is likely to be too busily engaged for some time to come on more important matters, but dairy farmers will do well not to overlook this proposal. It is to be hoped that in the meantime these medical officers may find something more beneficial to their employers to engage their attention. If this form of persecution is to be revived it will drive many men out of business, and a lessened production will be a greater evil than a low quality of milk. It is quite certain, if the dairy industry is to be developed in Britain, while conceding the necessity of control over production and distribution, that unnecessary restrictions and incompetent inspection must be reduced to a minimum.

WASTE OF COWS.

Appalling loss to the dairy industry is caused every year by the custom of buying freshly-calved cows for town dairies, milking them while profitable, and then fattening them for the butcher. For this trade the best type of cows are bought, usually after their second calf, and thus a constant drain of good milking cows, just in the prime of their lives, is going on. Is there any wonder at the constant complaint of the high price of stores and milking cows? If these animals were kept for breeding purposes they would each breed at least five or six more calves before completing their useful careers. If the Maintenance of Live Stock Act can be used to prevent this waste, it would do more good than the prohibition of slaughtering calves. Half the calves born are not worth keeping alive, mainly because they are bred from inferior dams; but if this waste of valuable and potential dams were stopped, it would have some effect on the quality of calves produced and on the price of store stock. This is a matter which concerns every dairy farmer who buys instead of breeding his own milkers.

THE PRESENT POSITION AND FUTURE DEVELOPMENTS OF DAIRY EDUCATION.—PRACTICE.

By PRIMROSE MCCONNELL, B.Sc., F.G.S., F.H.A.S.

THE part played by the development of dairy education in recent years, and what future development is likely to take place, induced the Council to arrange for an article on the subject. It has proved so large and important a subject, that, by arrangement, Mr. Mackintosh of Reading has undertaken in another part of the Journal what may be called the "laboratory" part of the work, while I propose in this to confine myself to the "farm." Even with this limitation, the subject is so wide that one hardly knows where to begin. As a matter of fact, "education" in this connection has a very wide meaning, and, to me at least, includes every improvement and development which has taken place in dairy farming, whether as the result of direct teaching in a school, or from books, or from modern and improving experience. It thus embraces the knowledge behind sanitation, milk recording, selection, breeding, feeding, and a host of other things which are now part of the routine of every well-conducted dairy farm, and it is the present and probable future of the application of knowledge to these subjects that I propose to discuss.

ORDINARY PROGRESS.

An incident within my own experience well illustrates the general progress of dairy education. Some 20 years ago I gave a lecture on milk and its production to a dairy farmers' association. The members heard me patiently to the end, but no discussion ensued, and not much interest was shown in the matter. Some eight or ten years afterwards I again gave a lecture to the same association and very largely to the same members, and on this occasion a keen discussion followed. A friend who was present on both occasions called my attention to the different reception of my second effort, and told me that my first attempt was clean over the heads of the audience, that I might as well have been talking Greek, but in the interval between the first and second occasion they had become familiar with the analysis of milk, the balancing of rations, the fitments of cowsheds, and a host of other things. It is quite possible, of course, that I may have been more understandable on the second occasion than on the first, as in the interval I had no doubt shed great chunks of knowledge and become a deal more ignorant than I was at one time, but still the change in the audience was there.

EARLY EDUCATION.

When general dairy education first took shape and dairy schools were first started, the work was largely confined to a study of improved methods of butter and cheese making. It took a long time for the

efforts of leaders in these matters to bear fruit, and the older race of so-called "practical" people sneered at the matter and refused to have anything to do with it. Most people believe in it now, however, and the deflection of public money to technical education under the county councils some 25 years ago gave a tremendous fillip to the work. Since that time, however, dairy education has assumed a much wider and more important position, and most all the branches of work connected with a dairy farm have now been developed on an educational basis. Looking at it from this point of view, therefore, it is not only such things as, say, the chemistry and bacteriology of milk and its products which constitute "education," and the practical application of these in making the products and in handling milk generally, but also the general management of a dairy farm in all its departments on advanced principles. We have already gone a long way in these matters, and gone with comparative rapidity in recent times, but we have still a long way to go yet before we reach even moderate success.

PERSONAL.

As a matter of personal history, my own dairy education began with a study of cowstalls and byre fittings, a subject I have not mastered yet, though I have studied those of many countries between the Alps and the Rocky Mountains. This was forced on me from having to work a lot in the byre in my youth, and this led to an attempt to plot and plan arrangements that would reduce the labour and increase the comfort, cleanliness, and health of the animals. Up to a few years ago the most perfect cowstalls were those which had been evolved in the dairy districts of the south-west of Scotland. This was owing to the fact that the majority of the dairies there were run by the farmers, their wives, sons, and daughters, who all brought a higher order of intelligence and education to bear on their work than the ordinary southern "cowman" usually does, and thus in the course of generations they hit on the best arrangements.

These arrangements were first "codified" or standardised by the late Mr. John Speir and myself some 35 years ago, and both he and I published them many times. They have been adopted by the Board of Agriculture and Fisheries as a satisfactory standard for style of cowstall and general shed arrangements, and are described and illustrated in Leaflet No. 241, but so far as I am aware, without any acknowledgment of their origin. I can go a long way further than that, however. I have a lot of plans of cowsheds—"byres" they are called in the north—which were drawn and coloured by my father sometime in the forties or the fifties of last century, and some of these Board of Agriculture diagrams are almost exact copies of those drawings. It has taken over 60 years for new and good education to permeate the community and for the northern ideas to come southwards, and our "authorities" seem only to have got hold of them now.

FITTINGS.

I said above that these were the best known arrangements up to a few years ago, but now a little more education and knowledge has

taken effect, and within the last few years we have had what may be called the "skeleton stall" introduced from America. Most everyone is now familiar with the stall fitments made with galvanised-iron piping, which is now largely made by British manufacturers also, and which is a great advance on the old solid "travises," both in cleanliness and ventilation, and in the labour involved in "tying up" or "loosing out" a cow. It is always a good plan to let the brains guide the hands and to study out new and better methods. The tying up and loosing out of a herd of cows twice a day involves a considerable amount of labour, and brains have now come to the rescue and devised easy and quick methods. There have been many nasty accidents as a result of the old methods, and these are now rendered impossible under the new. No one, of course, could afford to remove comparatively satisfactory stalls already in existence, but anyone who has a new set of fitments to make would be wise to look after these and consider their adaptability.

RECORDS.

Milk recording—another educational development—has come to stay. It was first systematically carried out in connection with the Ayrshire breed of cattle, chiefly on the initiative of the late Mr. Speir, while now the matter is being fostered by the Board of Agriculture, and grants are given for the purpose of helping on the work, and we have just concluded the second year of "official" testing.

The great object of recording milk yields is, of course, to find out which are the best yielding cows and which are the bad ones that should be eliminated. "Elimination" is a vague term. It may mean trying to sell a cow to a neighbour who has had some dairy education and knows more than you do—one of the disadvantages of education—or it may mean fattening off for the butcher. Anyway, the point is that only the progeny of the best milkers are reared to form the next generation. But this is only part of the whole. I practised this myself for 20 years and never improved my yield to any appreciable degree, for it is only in quite recent years that we have discovered that it is not the cows that give the big milk yields, but the bull. This fact may have been known to many, but I am positive that many more did not know it. Some 20 years ago I was discussing this matter with the late Mr. Wallace of Auchenbrain, Ayrshire, who, in his time was the champion Cheddar cheese maker of Scotland and a breeder of prize Ayrshire cattle, and he told me that one of his methods of selecting a bull was to take one with a yellow skin, because this was a sure sign of rich milk in his strain, on the principle that the Channel Islanders have yellow skins. I followed his methods several times afterwards, but neither he nor I ever thought then of enquiring into the question of how many gallons of milk the bull's dam yielded in a twelvemonth. We have had a tremendous development in our education since then, and no one who knows anything now would look at a bull whose dam gave less than a thousand gallons in a year.

RATIONING.

In no department has education had more improving influence than in the feeding of the animals. I was brought up myself to the practice of bunging cakes and meals into the cows literally in truck loads, as these were generally bought in lots of four to six tons to get the cheaper railway rate. When the milk yield declined a little, give a little more cake per head was the usual order, and thousands of pounds were absolutely thrown away in this way. The teaching of experiments began to take effect. These showed that when a cow was fed with more food than she really needed, there was not only a direct loss in the excess of food thrown away, but the cow herself was injured—possibly ending in milk fever at next parturition. The enquiries into the feeding of cows which have been evolved as a sort of side issue to the keeping of milk records has opened up a whole kingdom of knowledge, and in nothing more than in regard to the cost of keeping a cow. Many farmers who have been feeding cows all their lives and who had arrived at what they considered a satisfactory method or methods of rationing their animals have been astonished when the records worked out showed them that the cost was greater than the average of many farms or than that of their neighbours, and have been induced to set their house in order accordingly. Many more have been surprised to find what a small amount of “concentrates” are needed if a cow has sufficient grass in summer and fodder plus roots in winter to keep her going in a good paying condition.

Milk recording and food ration work is still in its infancy, though it is a generation old as measured by years. As a matter of history, the calculating out of rations on the “albuminoid ratio” theory first came from Germany, but I can remember that over 20 years ago while accepting the principles of the thing I challenged the figures myself on the ground that the tests which supplied the feeding standards were “made on German cattle, with German food and under the German climate,” and would not suit our British conditions, while the Americans came to the same conclusion and worked out their own scales.

It appears to me indeed that we have yet a mighty lot to learn in this matter, for I don't think we have yet arrived at the best methods of feeding a cow. Is it necessary to give cake and meal at all to one in milk if she has a sufficient allowance of hay, straw and roots? If so, how much should be given? So many experiments have shown that the cost of the cake is more than the extra milk produced is worth, that one does not know what to think. Hitherto, much of the information on this head has been obtained by simply collating the evidence of farmers as to how they actually have been feeding, but we want this and similar matters further tested by our educational authorities.

SELECTION.

We are getting the matter of “selection” reduced to a fine art. We take a record of the yield of a herd of cows both as to quantity and quality; we only keep for rearing the heifer calves that come from the best cows, or from cows which pass a certain standard of yield;

we take care that the sire of those calves has a milking pedigree behind him; and we feed each one on rations that are "balanced" and computed to give the best returns at the least cost. We usually reckon if a cow does not respond to good food at the pail, that she is "putting it on her back"; that is, she fattens, and is thus more of a beefeer than a milker, and should not be retained for milking purpose. I have, however, become convinced that there is another class of cow in our sheds which requires removal: she neither makes meat nor milk, she only makes dung. It is partly because of this that in milking or feeding experiments a cow needs to be weighed as well as milked to know how she is getting on, and if she does not respond either at the pail or the scales she ought to be removed.

The "dual-purpose" cow is to me one of the things we should strive after. I do not at the moment know what Mendelism could teach us in the matter, but we have already with us some four breeds—the Shorthorn, the South Devon, the Red Poll, and the Dutch—which contain many hundreds of individuals which conform to the description—milk and beef combined—while the future will undoubtedly see their number largely increased. Probably some of the crosses (such as a Dutch-Shorthorn) would produce the best kind of animal for this purpose, but, unfortunately, crosses cannot be made permanent breeds without a very great expense and a very great time being expended on the same, while Mendelism would, no doubt, have a lot to say in explanation of "recessive" and "dominant" characteristics. There is, anyway, plenty of room for acquiring knowledge in this line in the future, either by actual experimental tests or from general observations.

SANITATION.

There is a good deal to be done yet in the matter of sanitation, and chiefly in the training of medical officers of health. These gentlemen in the past have very largely been agitating and moving for the enforcement of conditions or restrictions which are practically impossible to carry out upon a dairy farm. The majority of them have learnt their chemistry, and bacteriology in a laboratory, but do not know a cow from a horse except by the horns, and have still to learn the practical application of their knowledge. To me, the most important feature in connection with the sanitation of a cowshed is to have the stalls properly fitted up and the gutter behind of perfect design and proper alignment. If this is seen to, then nine out of ten cows will keep themselves clean, and require comparatively little grooming or "washing." If, on the other hand, the stalls are improperly arranged, then no amount of litter or grooming will ever keep the cows in a respectable state. This is a branch of education I would like to see developed, for, unfortunately, there are many farmers who do not yet understand the proper arrangements, while I have known cases where the sanitary inspector was actually fool enough to insist on the arrangements being made the wrong way about. I said above that Mr. Speir and myself reduced the most efficient kind of cowstall to a "standard" form in bygone years. I now say that we will be wise to take note of what they do across the

Atlantic in this matter. Labour is exceptionally scarce and dear over there, and thus much of the work, which in this country would be relegated to hired servants, has to be done by the farmer or his son. The result of this is that they are on the outlook for the easiest and most efficient methods of working for their own sakes, and have thus designed apparatus and adopted methods we would be wise to pay attention to, if not adopt. Neck-yokes, drinking troughs, cork-floored stalls, beds made of sawdust-concrete for comfort, litter carriers, and so on, have all been designed and adopted far ahead of us, tested at the agricultural colleges or dairy schools, and the "science" of these taught to their students.

A cow in a state of nature would be a cleanly animal. One out at grass does not require grooming, and her general health remains good, but immediately she is brought indoors we, in the ordinary course, compel her to be filthy. We did not understand the nature of this filth until the science of bacteriology took it in hand, but we understand it now—at least some of us do—and to my mind the application of methods whereby a cow could be kept clean, or, better, keep herself clean, is one of the best educational results we could have, and I hope to see still further progress in this direction. The practical application of knowledge in this way is largely a matter of mechanics and building construction, but we are getting on little by little.

At the risk of repetition, it is necessary to emphasise this matter, namely, proper homestead arrangements. The object of dairying is to produce clean, healthy milk, and plenty of it, and nothing conduces to this so much as the method of milking and the treatment of the cows when indoors. We occasionally hear of a taint acquired outside from eating some objectionable plant or from drinking dirty water, but trouble from these is far more rare than that due to inferior housing accommodation. Future education and development, therefore, must be more in this line than in any other. We must control conditions at the fountain head, as it were. For this reason, therefore, I can easily prophesy that the future will see great advances in general sanitation, ventilation, lighting, conveniences for handling the dung, and so on.

INSPECTION POINTS.

In connection with this, the future development of dairy science on the scheme of awarding "points" on a card according to a percentage agreed on as to the conditions existing on a farm is likely to be a prominent feature. On the farm or in connection with the actual animals themselves such things as water supply, ventilation, drainage, grooming of the animals, freedom from tuberculosis, and a large number of other matters all go to make up the whole management; and the position or qualifications of a farm and the method of management thereon can be assessed on a scale of percentage points. This is one of the latest sanitary ideas, and it is likely to be worked out still further.

Throughout the above I have assumed that education is the same as development and improvement. It is difficult to foresee in every detail what is going to happen "after the war." There are likely to be new

methods of cropping whereby a greater amount of cow-food will be produced, so that more cows may be kept on a given acreage or fewer acres required for a given herd. There will be greater attempts made to improve our ordinary pasturage, and a lot has yet to be found out in this line. One always thinks of basic slag in connection with this, but basic slag fails in many cases—as it has done with me—and no manure of any kind will have effect on some soils. There will be a greater development of the silo system of preserving green forage for winter use, and, perhaps, something will be accomplished in the way of a better utilisation of the solid and liquid manure—both of which are frightfully wasted under present conditions. We look to our educational institutions for light and leading in all these matters.

CONCLUSION.

The question naturally arises: Where is this “farm” education to be had in the future: is it to be by costly experience as in the past, or at a dairy college, or as an apprentice on a farm? I should say partly in all three ways, but principally on the farm, as it is the practical working of the same that must count in the end. The best equipped dairy farmer—apart from questions of capital—is one who has spent some time in his youth on a dairy farm, taking his share of the work (if he is a dairy farmer’s son so much the better), and who then, equipped with practical knowledge, attends the usual courses at a dairy school. He will pick up the “science” much more readily because he has already been through the “practical” mill, and he will emerge with his brains trained to look towards the betterment of his life-work. The days of gaining knowledge by costly experience are not altogether gone yet. I have been through a few myself quite recently—but we know a lot more now than we did say ten years ago, and every fact ascertained is a stepping-stone to further developments and improvements. It is by a co-ordination of science and practice that dairy farming will be developed in the future.

THE PRESENT POSITION AND FUTURE DEVELOPMENTS OF DAIRY EDUCATION.—SCIENCE.

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INTRODUCTION.

THE object of this paper is to place before readers of this Journal, particularly those who have paid little attention to education and research in the past, a concise account of the system of dairying education which has gradually been developed in this country, and to indicate the most necessary lines of future development.

As this number of the Journal is specially concerned with the development of the dairy industry, and as the progress desired by the writers of other articles must be based very largely on an increased appreciation and utilisation of scientific education and research, it is desirable that some information on this subject should be at the hand of every reader.

THE RECENT REORGANISATION OF EDUCATION AND RESEARCH.

Education and research in dairying and allied subjects cannot be satisfactorily considered except as part of the national scheme of agricultural education and research. The whole subject of agricultural education has been carefully studied in its broader aspects during the last ten years, and particularly by the committee presided over by Lord Reay, which presented its report in 1908; this committee pointed out clearly the deficiencies which then existed, and made many useful suggestions for improvement and development. Since that date the passing of the Development and Road Improvement Funds Act, 1909 and 1910, and the consequent provision of much larger sums of money for agricultural education and research, has enabled comprehensive new schemes to be thought out and brought into operation to a greater or lesser extent in almost all the counties of England and Wales.

The scope and method of these schemes cannot be more clearly stated than in the following extracts from the *Report of the Development Commissioners (H.C. 305) for the year ending March 31st, 1912.

“ The schemes for the extension of a system of education fall under two main heads: first, the division of England and Wales into 12 areas, each centred round an agricultural college, and grants to those colleges to enable them to demonstrate the application of known results to local conditions and

* See Journal of the Board of Agriculture, December, 1912, pp. 777 and 778.

to provide technical advice to local agriculturists; secondly grants to county councils to enable them to provide or extend farm institutes or schools—educational centres which will give short winter courses or similar instruction, and also be the headquarters of an increased county staff of itinerant teachers, advisers and organisers.”

As regards research, the scheme adopted was based on two main principles—

“First, that what may be called pure research is not a local matter, and the proper division of effort is not by geographical districts; and secondly, in order to be really effective it must be continuous and concentrated. Attempts have therefore been made to divide agricultural science into 11 main branches, and to provide for systematic research into each of these at one or two institutions devoted to that subject.”

“When these schemes are in full operation the Commissioners hope to see an organic system of research, technical advice and education covering the whole of England and Wales. At the head will be the research institutes, each carrying forward the investigation of a particular branch of agricultural science, and with similar Irish and Scotch institutions, covering practically the whole field of that science. Next, there will be the colleges, whose duty it will be to provide the highest form of education in agriculture, to demonstrate by experiment the application to local conditions of the results obtained by the research institute, and to advise farmers within their areas on the more difficult problems of farm practice. Last, there will be the farm institutes, closely connected with the colleges, providing education for classes to whom the long college course is unnecessary or impossible, and finally, by means of the itinerant county staffs centred at them, advising the farmers in the simpler and less far reaching difficulties which require for their solution no great scientific knowledge or prolonged scientific training.”

THE PRESENT FACILITIES.

The above schemes were introduced in 1912, and, while in some counties there already existed facilities for education which to a large extent met the requirements stated above, in others, nothing had been done, and it is obvious that the outbreak of war in 1914 made progress towards their realisation very slow indeed. For the purposes of this article, however, it is desirable to inquire fully, as regards education in dairying, what the present position is in the various counties and provinces.

Education in Counties.

The instruction provided by counties takes the form of (A) *itinerant instruction*, and (B) *instruction at a fixed institution*, either a county farm-school or agricultural college; some counties provide both.

Itinerant Instruction.

The *itinerant instruction* is taken to different parts of the county in successive years and is given as:—

1. Day courses in cheesemaking held at farms for a period of weeks.
2. Day courses in buttermaking held at suitable centres for a period of days or weeks.
(The so-called travelling dairy schools provided by some counties visit a considerable number of centres each summer.)
3. Evening courses in buttermaking.
4. Lectures and demonstrations in dairying subjects.
5. Advisory visits to dairies and farms.

The objects of the itinerant instruction are to take information to those who need it and are unable to leave their own homes for any length of time to obtain it, to awaken interest in improved methods of dairying, and in education generally.

The staff employed for the provision of itinerant instruction varies according to the importance of dairying in the county. Where there are well-organised courses in cheesemaking and buttermaking, there is a fully qualified instructress in dairying, and often an assistant instructress also, but where the work is less well developed sometimes a part-time instructress is employed, and in other counties there is no county staff specially for dairying, such lectures and advisory work as may be required being given by the agricultural organiser or by members of the staff of some county or provincial institution. Sometimes the giving of lectures and demonstrations in poultry work is combined with dairying to form the duties of one instructress.

Of the 61 local education authorities responsible for the provision of agricultural education in the various counties and parts of counties in England and Wales, at least 22 make no provision for organised classes in dairying, either by travelling schools or at fixed centres, and in some of these areas, *e.g.*, Dorset, Buckinghamshire, Sussex, dairy-farming is one of the predominant branches of agriculture. The other local authorities provide either itinerant instruction only, or both itinerant and fixed instruction (chiefly in cheesemaking counties where courses of several weeks' duration are desirable), and in a few instances instruction is only provided at fixed institutions. It should also be mentioned that some counties provide scholarships, obtainable by competition, to enable promising students at country classes to obtain further instruction at central institutions.

Instruction at Fixed Centres.

The county farm schools or colleges provide courses in dairying which vary from 4 to 14 weeks in duration according to the subject, and at the end of the course certificates are usually awarded to the students who have passed the prescribed tests. Only one centre—the County Council Farm, Hutton, Lancashire—provides a longer

course, namely, one of 40 weeks, on the successful completion of which the student is awarded the Lancashire Dairy Diploma. In addition to the practical instruction in buttermaking and cheese-making, lectures are given on a more extended scale than is possible in country courses, and the work generally is of a higher standard. Also, most of the centres are located on a farm which supplies milk to the dairy school, and the pupils can, therefore, see the methods of feeding and management of the cows and the treatment of the milk from the cowshed until ready for market as butter or cheese.

The staff employed at the county institutions is very similar to that required for the itinerant work as far as the practical instruction is concerned, but the lectures in dairy-farming, chemistry and bacteriology (in relation to dairying) are given when possible by lecturers who are, to some extent, specialists in these subjects.

The county centres for instruction are :—

1. Newton Rigg Farm School, Penrith .. Cumberland and Westmorland.
2. Sherburn Hall, Durham Durham.
3. County Council Farm, Hutton ... Lancashire.
4. Dairy School, Garforth, Leeds ... County and Province of Yorkshire.
5. Worleston Dairy Institute ... Cheshire.
6. Technical School for Girls, Radbrook ... Shropshire.
7. Dairy School, Griff House, Nuneaton ... Warwickshire.
8. Central Dairy School, Gloucester ... Gloucestershire.
9. East Anglian Institute for Agriculture, Chelmsford ... Essex.
10. Lleweni Hall Dairy School, Denbigh ... Denbigh and Flint.
11. Madryn Castle Farm School, Pwllheli ... Carnarvon.

A certain amount of instruction in dairying is also given at the University College of South Wales, Cardiff, the Hants County Farm School, the Swanley Horticultural College, Kent (Women only), and the Studley College, Warwickshire (Women only), also at most of the agricultural colleges as part of the agricultural courses; in addition, some counties have schemes on hand for the formation of new farm institutes and dairy schools.

Number of Students attending County Courses of Instruction.

The total number of students attending the various day and evening courses and short courses provided by the counties in England and Wales, either in the country or at fixed centres, during the year 1913-14, was between 3,600 and 3,700 (this does not include the attendance at dairy lectures and demonstrations), but this mere statement of numbers does not supply a basis for judging the sufficiency of the facilities provided, nor if the courses are appreciated and taken full advantage of. In the map on page 97 an attempt has been made to show the distribution of those areas where education in dairying is provided, and also the relative number of pupils—each dot on the map representing five pupils attending short courses at movable or fixed

centres. The figures of attendance on which the map is based are those given for the various counties in the Annual Report of the Board of Agriculture* for 1914-15, but, while these are the only statistics available at present, they do not lend themselves to as accurate a representation on a map as is desirable, because the figures for a county with a good school may include some pupils holding scholarships from neighbouring counties, also, they do not include students taking long and short courses at provincial centres of instruction.

Another attempt to show some relationship between the numbers of students attending courses and the intensity of dairying in the various provinces is shown in Table I. The four columns show respectively, the number and name of the province, the total number of cows,† the total number of students and the number of cows per student attending the courses.

TABLE I.

| PROVINCE. | No of Cows in Province. | No. of Pupils in Province. | No. of Cows per Pupil. |
|-------------------------------------|-------------------------------|----------------------------------|------------------------------|
| I. Northern Counties | 144,564 | 397 | 364 |
| II. Yorkshire | 224,062 | 51 | 4,393 |
| III. Midland College Area | 210,469 | 339 | 621 |
| IV. Eastern Counties | 233,374 | 469 | 498 |
| V. South-east England | 128,166 | Nil. | Nil. |
| VI. Reading University College Area | 216,225 | 182 | 1,188 |
| VII. Devon and Cornwall | 198,792 | 362 | 549 |
| VIII. West of England | 325,549 | 670 | 486 |
| IX. Salop, Stafford, and Warwick | 217,555 | 385 | 565 |
| X. Aberystwyth Area | 231,072 | 372 | 621 |
| XI. Bangor Area | 88,083 | 41 | 2,148 |
| XII. Cheshire and Lancashire ... | 266,309 | 358 | 744 |
| | 2,484,220 | 3,626 | 685 |

The average number of cows per pupil is 685, and if the average herd of cows be assumed to be 15, then apparently but *one* pupil was drawn from *every 45 farms* per annum.‡

Time has not permitted the preparation of an account of the facilities in Scotland, but the system is much the same, except that there are no county farm schools, and the country instruction work is largely directed from one or other of the three agricultural colleges.

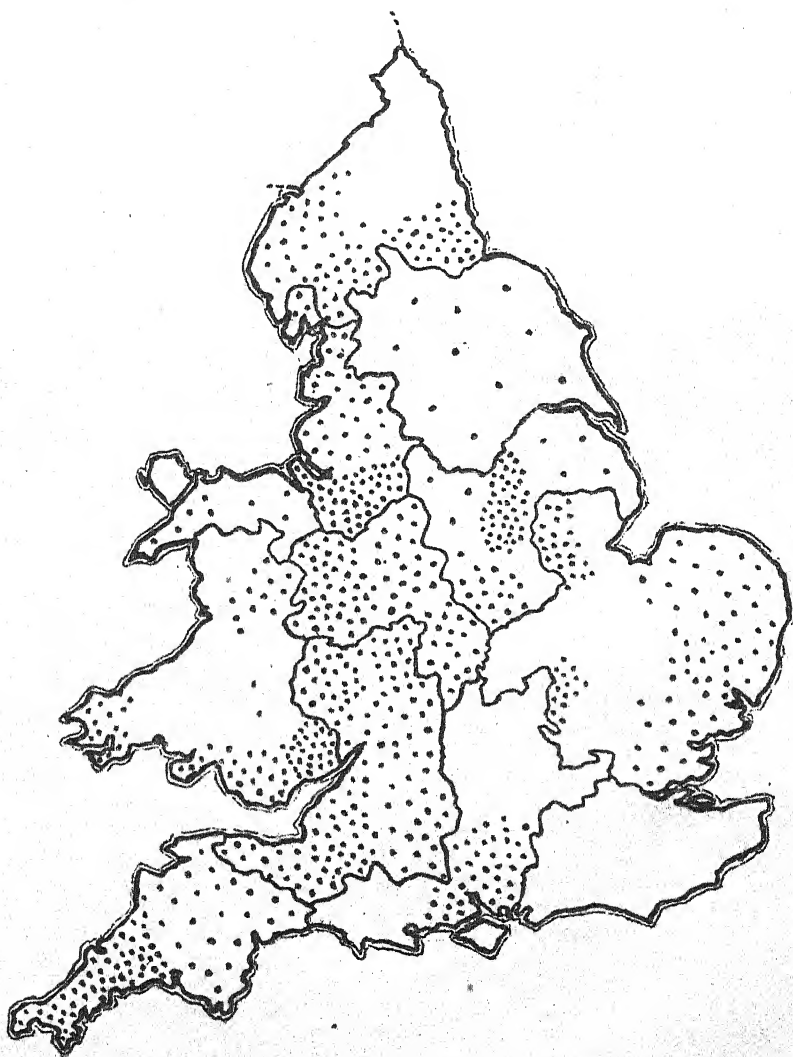
* Annual Report of the Education Branch on the Distribution of Grants for Agricultural Education and Research, 1914-15. (Cd. 8066.) Price 8½d.

† Number of Cows in Milk and in Calf (including heifers with first calf), from Board of Agriculture Statistics, 1914.

‡ In 1914 there were in England and Wales 343,554 holdings of over 5 acres. Taking the above number of pupils, apparently but one pupil was drawn from every 94 holdings.

MAP
SHOWING DISTRIBUTION OF COUNTY INSTRUCTION IN
DAIRYING.

Each dot represents 5 pupils attending short courses at fixed or movable County Centres.



Education at Provincial Institutions.

Of the central institutions for agricultural education in each province, only three provide full courses of instruction in dairying. These three are :—

1. The Midland Agricultural and Dairy College, Kingston, Derby.
2. University College, Reading, with the British Dairy Institute.
3. University College of Wales, Aberystwyth.

The above colleges provide both long and short courses of instruction. The short courses vary in length from four weeks to three months, and certificates are in some instances awarded to successful students; longer courses, extending for six months to one year are also given, and at two centres these courses are definitely described as "certificate" courses, while at the Midland College a course from October to June qualifies for entrance to the examination for the college diploma in dairying, and another course of similar length is specially designed for factory managers. At Reading and Aberystwyth the "diploma" course is of two years' duration, and at the present time these courses are the fullest and best obtainable in England and Wales. In Scotland, only one centre for dairy education is maintained—the Dairy School for Scotland, Kilmarnock. This institution provides courses of instruction for certificates, and a two years' course for a diploma; during recent years the instruction provided has given such satisfactory results that many students have been attracted to Kilmarnock from England and Wales.

The long courses at all these centres provide very full instruction and practice in the making of butter and cheese, and full series of lectures on dairying, dairy-farming, chemistry and dairy chemistry, bacteriology and dairy bacteriology, veterinary hygiene, and animal physiology; practical work in the laboratory accompanies the lectures on chemistry and bacteriology, and shorter series of lectures on book-keeping and botany are also included.

Instruction in the hand-milking of cows is provided at the farms attached to the various centres, but in those cases where the dairy is not located close to the farm there are not the same facilities for bringing the instruction in the production and management of milk at the farm up to the standard of the instruction given inside the dairy.

The staff usually consists of an instructor in cheesemaking, and an instructress in buttermaking, with such qualified assistants as may be necessary, and the equipment for educational purposes is more extensive than at the smaller centres. Also the lecturers on the sciences and other subjects usually have had special training and experience, which enables them to make their lectures interesting, exhaustive, and up-to-date.

The numbers of students attending these colleges in the years 1912-13 and 1913-14 were as follows:—

| | COURSES OF ONE YEAR & UPWARDS. | | SHORT COURSES. | |
|--|-----------------------------------|----------|----------------|----------|
| | 1912-13. | 1913-14. | 1912-13. | 1913-14. |
| Midland Agric. and Dairy College ... | 17 | 19 | 106 | 93 |
| University College, and British Dairy Institute, Reading | 11 | 7 | 66 | 58 |
| University College of Wales, Aberyst- wyth | 6 | 3 | 45 | 39 |
| TOTAL | 34 | 29 | 217 | 190 |
| Dairy School for Scotland, Kilmarnock | 5 | 19 | 253 | 263 |

External Examinations.

This brief summary of the dairy education work in Britain would be incomplete without some reference to the examinations held and diplomas awarded by the British Dairy Farmers' Association and the National Agricultural Examination Board (the latter being appointed jointly by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland).

The British Dairy Farmers' Association awards certificates in buttermaking and cheesemaking, a dairy teacher's certificate and the B.D.F.A. Diploma to those candidates who comply with the prescribed conditions and pass the examinations, while the National Examination Board holds one annual examination in England and one in Scotland, and awards to successful candidates the National Diploma in Dairying (N.D.D.).

Most of the students taking courses for college diplomas also enter for either or both of the above, as they are considered to be more desirable and valuable qualifications. Judging from the number of students entering, the National Diploma in Dairying is the more highly esteemed of the two.

Research Work.

Comparatively little can be written at the present time about research work in dairying in Britain—extraordinarily little when one considers how long cheesemaking and buttermaking have been practised throughout the country, how great has been the increase in dairying in the last 40 years and how important this industry is as a contributor to the food supply of the nation.

Before 1912 research work had only been carried out spasmodically and by chemists and bacteriologists who were primarily engaged at other work, for instance, Lloyd's investigations into Cheddar cheese in 1901—1908, and the investigations carried out at Garforth

by Ingle and Crowther on the composition and variation in the quality of milk. In 1912, however, as part of the new schemes of agricultural education and research inaugurated by the Development Commissioners, a Research Institute in Dairying was established at University College, Reading, with a research chemist and a research bacteriologist as the nucleus of a staff.

Work was at once commenced on some important problems, and most useful results have been obtained. On the invitation of the Royal Agricultural Society, the staff of the institute carried out and reported on the bacteriological and chemical tests in connection with the trials of milking machines held at Bishop Auckland in 1913. Experiments on ventilated and unventilated churns for the conveyance of milk, and on the preparation of home-made rennet were carried out at the request of the Board of Agriculture. Investigations are in progress on the viability of *Bacillus tuberculosis* on pasture land, and on the causes of discolouration of Stilton cheese—the latter is proving to be a very complex problem.

The various investigations have been, unfortunately, hindered by the war and the consequent depletion of staff, and also by the fact that the equipment of the Institute is not complete. Sufficient facilities have not yet been obtained for submitting conclusions arrived at in the laboratory to more practical tests on an extended scale in the cowshed and dairy, but the difficulties in this respect may be overcome in the near future.

While the Institute at Reading has been established solely for research in dairying, the work to be carried out at some of the other institutes will also be of great value to the dairying industry, notably that of the Research Institutes for Animal Nutrition at Leeds University (where the nutrition of the milk-producing animal is receiving special attention) and at Cambridge University, the Research Institute in Animal Pathology at the Royal Veterinary College, and the Research Institute in Agricultural Economics at Oxford University.

SOME FUTURE DEVELOPMENTS.

It has been already pointed out that the national system of agricultural education has recently been reorganised and extended. The outline given in the preceding pages of the facilities as regards dairying, which have been largely brought into line with the new schemes, must therefore be taken as the basis for developments in the future. Mr. T. H. Middleton, of the Board of Agriculture, may be quoted in this connection:—

* “What our system of education mainly wants is time to grow. I hope that in the general reconstruction after the war it may not be considered desirable to dig up this young plant to examine its roots. Manure (in the shape of funds) and not tillage of a drastic type is wanted meantime. It is in a sense

* See “The Recent Development of German Agriculture,” p. 46.

unfortunate that our new system had just got started before the war, and that its results will be sought at a time when patience, so necessary for development, will be difficult to exercise."

At the same time, while the new system is sufficiently elastic to meet a great variety of future needs, one effect of the war has been to break down many prejudices and to create a unique opportunity for the discussion of new points of view, also some of the dairying schemes at present in operation are legacies from earlier times, and material alteration may be necessary to adapt them to the requirements of the future.

Relation of Research to Education.

In the summary given in the foregoing pages, one of the most notable points is the almost complete neglect of research (up to 1912) and the apparent concentration of such efforts as were made on education, particularly itinerant instruction. This feature may be partly due to the tendency of local agricultural education authorities and farmers to pay attention to, and to expend public and private money on only those subjects which appear to them to be of so-called "practical" value, and partly due to the lack of recognition by the national authorities responsible for agricultural education of the supreme importance of research, and the need for a scheme which was national as well as local in its application.

Whatever may be the true explanation of this procedure, it is highly interesting to find that in Germany, where phenomenal progress has been made during recent years in every branch of farming, the order of development in education and research has been exactly the opposite. In Mr. Middleton's recent report* we find the following statements:—

"The policy aimed at in Prussia was, in the first place, to secure facilities for the study of agriculture in institutions of University rank; it was recognised that before suitable instruction could be provided for small farmers there must first of all be careful study of methods and principles, such as is only possible at institutions possessing a large and well-trained staff."

"So soon as substantial progress had been made in the study of agriculture at the Universities, when teachers had been trained and text-books written, Prussia began to provide instruction for peasant cultivators, and in the last few years great progress has been made in this direction."

The report goes on to state that winter schools at fixed centres and itinerant instruction during the summer has been very successful in Germany, but the essential points in this comparison are that the itinerant instructor and adviser and winter school lecturer in Germany can say that the information and advice he gives has been proved to

* *The Recent Development of German Agriculture*, pp. 23 and 25.

be suitable to German conditions because it is based either on research work originating in his own country, or on experiments repeated there demonstrating the utility of results obtained elsewhere, and he can obtain reports of the actual experiments in his own language, whereas, in this country both the itinerant instructor and college lecturer have had to depend for their information on many notable improvements and far-reaching experimental results solely on translations of reports from German or other languages.

We have thus become, through our neglect of research, very largely dependent on foreign countries for the basis of our educational work, and, indeed, also for the apparatus, material, or machine by which the results of research are employed in dairy work. A few instances of the latter may be given:—The “Babcock” method for the rapid testing of samples of milk for butter-fat was brought out in the United States, and the simplified “Gerber” method in Switzerland; most of the glass-ware and testing appliances now in use are imported from Switzerland. The use of “starters” of pure lactic acid bacteria was first worked out in Denmark and Germany, and the pure cultures used in this country are almost entirely imported from Denmark and the United States. Rennet extracts, either in solution or as powder, were first manufactured in Germany, and the bulk of the extract used in Britain before the war came from Denmark and Holland. The separator was the invention of a German, and the Swedes and Germans have been the most active agents in bringing it to its present state of perfection. The manufacture of condensed milk was first worked out by an American, and most of the newer forms of dairy machinery for pasteurising, sterilising, bottle-filling and bottle-washing are imported from America or the Continent. Also, the standard text-books on the nutrition of dairy and other stock are of German or American origin.

One other result has been that the improvements in practice resulting from scientific research have found their way slowly into this country, often long after they have been incorporated into the daily practice in other countries.

All itinerant instructors and lecturers know how much more convincing and effective their work is when they can support their recommendations by reference to experiments which they have seen themselves at their central institutions, or which have at least been carried out in Britain, instead of merely quoting from some foreign report, and there can be no doubt that the lack of facilities for research in this country has greatly handicapped all branches of agricultural education.

It is to be hoped that farmers and others associated with agricultural education will realise more clearly the fundamental dependence of itinerant and farm school instruction on the work of research institutes and the investigation and demonstration work of the colleges; and that the realisation of this dependence will lead to a greater interest being taken in, and more assistance given to research and investigation.

Equipment of Centres for Demonstration.

With the development of research must come greater facilities at provincial institutions for the testing of the conclusions and recommendations of the research workers, and at all institutions (county and provincial) for the demonstration of the method and efficiency of all tested improvements, whether for the dairy or the dairy farm. In the past, in addition to the lack of clear thinking, the lack of sufficient opportunity for the testing of ideas for improvements has resulted in some suggestions being given to farmers which were found by them to be unworkable, and many farmers have thus been led to think lightly of scientific work and method.

In reality the scientific method is more severely practical than are the methods of many farmers. It cannot be too often explained that theory and practice are not opposites, but are really parts of a whole—a theory or idea must come first, then the careful and thorough testing and criticism of the theory, then modification according to varying conditions, or honest rejection, then further tests, and finally the practical conclusion and recommendation. The commonest of dairy farm practices, *e.g.*, the milking of a cow to get milk for human food was at first a theory, and doubtless its originator was roundly condemned as an unpractical dreamer by his fellow-tribesmen.

Scope and Duration of Courses of Instruction.

The development of research work in dairying in this country will not only give us first-hand knowledge on many important subjects, but will lead to the results of similar research in other countries becoming more quickly known here; these effects must in turn lead to a higher standard of instruction, particularly in the long courses given at the central colleges.

One of the functions of these central colleges is to provide the highest form of education in dairying. At the present stage of our experience it would be difficult, if not impossible, to say exactly what courses would fulfil that requirement, but it should be remembered that the aim of true education is not the successful passing of examinations, but the training and development of all the faculties so that the student will be able to make the most of his natural ability, and to tackle by sound methods the various problems which confront him after he leaves college.

The particulars supplied in the previous pages show the subjects which are taught, and the length of time allowed for the various courses. This article does not afford space for a statement of the number of hours devoted to each of the subjects.

Long Courses.

All the courses at present provided which cover one or more years are designed to give full instruction in the science and practice of dairying, and they constitute the organised education available for those who desire an all-round training. There is room for much

discussion and criticism on the scope, efficiency, and duration of these courses, and two points will be dealt with more fully later.

Recent discussions held at Reading on the duration and scope of diploma courses resulted in clear agreement that a period of two years was the minimum time required, but the allocation of this time was a much more difficult matter. It is by no means easy to allot as much time to each of the subjects as the lecturers and practical instructors consider desirable, and in the writer's opinion it would be an advantage to provide a three years' course—two years for ordinary diploma work, with a third year for specialisation in dairying and in dairy farming. There is a great dearth of really well-trained instructors and advisers in these subjects at the present time, and, while the positions requiring this special knowledge have been but few in the past, the opportunities for acquiring the knowledge have been still fewer, with the result that when vacancies now occur there are no specialists to fill them.

The need for specialists in dairy chemistry and bacteriology is also sure to increase in the future, and students who wish to take up these subjects would probably be well advised to obtain a degree in pure science or in agriculture before commencing specialisation.

Short Courses.

The majority of the short courses, and particularly those at movable centres, are designed to supply instruction on some definite subject, *e.g.*, buttermaking or cheesemaking, and have often had their origin in a wish to supply a local need rather than in an effort to realise an educational ideal. These courses have as a rule given very satisfactory results, and much credit is due to the organisers and instructresses in those counties where this work has been efficiently carried out for years.

Where the short courses are designed to give instruction in dairying as a whole, it may be doubted if they have been very successful. Such courses are usually given at county or provincial centres, and they have often attempted to deal with too many subjects in the time available, also those subjects which have received most attention have not always been the most important. The chief defects in these courses and also in many of the long courses, has been that buttermaking has received too much attention, and that the actual production and management of the milk, especially milk for sale as human food, has been almost neglected.

Relative Importance of Buttermaking, Cheesemaking, and Milk Production for Sale.

Statistics compiled for the census of agricultural products in 1908 showed that the total milk produced in England and Wales, after allowing for calf-rearing, was almost 1,029 million gallons, and that this was utilised as follows:—Sold as whole milk, 71 per cent.; as cream, 1 per cent.; as butter, 12 per cent.; and as cheese, 4 per cent., leaving 12 per cent unaccounted for, most of which was probably

consumed or made into cheese and butter at home. Also, a table given by the writer on another page of this Journal, shows that for every 100 lbs. digestible nutriment consumed by a cow in milk, there is produced as human food 18 lbs. of edible solids when the milk is used as such, 9.4 lbs. when it is made into cheese, and 5.4 lbs. when it is made into butter. Finally, the increased demand for cheese since the war commenced has made the manufacture of cheese much more profitable than buttermaking both to the farmer and to the nation. These figures and facts show conclusively the relative importance of the various branches of dairying, and afford a sound reason for a readjustment of the instruction provided in many of the courses.

It may be said that the whole includes the part, and that instruction in buttermaking and cheesemaking includes instruction in milk production and management, but it has so happened that it is precisely this part which has been neglected in favour of the more spectacular parts of churning, getting a perfect grain, and making up pretty blocks.

It is recognised by all that the first essential in the manufacture of high-class dairy produce is clean milk, also, the most serious difficulties of the buttermaker, cheesemaker, milk distributor and consumer—certainly those difficulties which occur most frequently—are due to dirt, with its associated bacteria, which has been allowed to get into the milk, at or after milking. Obviously, therefore, the training of the student in the best methods of the production and management of milk should be at least as comprehensive and thorough as his training in its manufacture into various products.

Suggestions for Improved Instruction in Milk Production and Management.

If efficient instruction in this subject is to be given, there must be a much closer association in management between the cowshed and the dairy. In the past, the common arrangement has been that the farm manager was responsible for the milk up to its entry into the dairy, and the instructor in dairying responsible for it afterwards. This system is as though one man was responsible for the preparation of the soil, the sowing and manuring of a crop, and another had to undertake the responsibility of the harvesting and successful marketing of it. Some arrangement whereby this duality of control is dispensed with, or complete harmony assured, is one of the problems of the future for dairy schools and colleges with associated farms.

In cheesemaking and buttermaking courses, the actual instruction and practical work necessary can be incorporated into the existing courses with some slight alteration of subjects and time-tables, and where the farms and dairy are located close together this alteration will be a much easier matter than where they are a few miles apart.

Instruction in Milk Production for Sale as Human Food.

The provision of instruction in the production and management of milk for sale as a human food is a new subject, and here the need is three-fold.

The first need is an improvement in the instruction at the large central institutions. Such changes as may be necessary should be introduced into existing courses, or, if desirable, a new course should be instituted. None of the existing short courses have been specially designed to meet the needs of those producing milk for human consumption, yet more dairy farmers are engaged in this branch of dairying than in any other. A course designed for this purpose should give, in addition to the usual lectures on the chemistry and bacteriology of milk, full information on the best methods of management and feeding of cows, the cleanest and most efficient methods of milking, straining, cooling, and subsequent treatment of milk for transit either in bulk or in small quantities, the best kinds of utensils and other equipment, the special conditions necessary for the production of "certified milk" and the use of dairy farm score cards, the commonest sources of contamination, and the value of clean milk, both to the individual and the community; demonstrations of the keeping qualities of clean milk, the determination of sediment by the "Gerber" dirt tester, and other simple tests could be added to those given in milk testing as usually understood. It would be essential to the success of such a course that the best methods, etc., given in the lectures should be *illustrated in the daily routine* of the farm associated with the institution; and, if practical instruction in these methods could also be given, the value of the course would be greatly increased.

The second need is the provision by urban health authorities of free instruction to the general public on the value of milk as a food, the influence of a good or a bad supply on the life and health of children and the community as a whole, and the best methods of management of milk in the consumer's home. Had city and town health authorities realised in the past their responsibilities in this respect, a demand would have arisen for an article produced and handled under distinctly cleaner conditions than the present day average, and with the demand there would have been a willingness to pay a slightly higher price for guaranteed cleanliness and quality. Farmers are continually being told how much better are the methods of milk management in the United States, but the cities in that country took the lead in this matter. In addition to the provision of free lectures and printed advice many of them in recent years have held *milk shows*, with no charge for admission, for the specific purpose of educating the public in the value and management of milk. One such show (with the motto "to enlighten, not to frighten"), held in Philadelphia in 1911, was open for eight days and was visited by 110,000 people. No milk shows have yet been held in Britain.

The third need is the provision of instruction by the county education authorities in those counties where the production of milk for human consumption is an important part of dairy farming. This instruction may be given at the farm school or throughout the county, and should be on the same lines, with such adaptations as may be necessary, as the instruction outlined for the provincial centres. It must be quite clear, however, that the appreciation of such courses of

instruction by the farmer will be dependent on the demand created by the spread of knowledge among consumers.

In several other branches of dairy education there is room for improvement and reorganisation, but space forbids more than the mention of a few of these.

Itinerant instruction should be developed as much as possible, particularly in the dairying districts not at present provided for, as this form of education reaches the largest number of people, awakens interest, and creates a desire for more knowledge. There should be a larger number of scholarships enabling promising students to proceed from itinerant classes to farm schools or to the larger institutions. Conferences of county staffs engaged in dairying should be held from time to time at convenient centres to afford opportunity for comparing methods and results, and for acquiring the latest information on new work.

Lastly, the methods by which useful new information is placed before farmers requires careful study, with a view to being made more effective. An enquiry into all aspects of this subject could not fail to be of great value, as the manner in which the results of research and investigation are laid before farmers has an incalculable effect in making them sympathetic or otherwise towards such work and towards agricultural education in general. .

THE PART WHICH WOMEN MIGHT PLAY.

By MARGARET SHANKS.

BEFORE considering what additional or special help women could give in the effort to increase the dairy production of Britain, it might be advisable to take a cursory view of what they have done in the past, and the lines upon which they have been advancing of recent years. Since the very dawning of agriculture, when butter and cheese were first made by the most primitive methods, these were essentially domestic occupations. In early times, when the agricultural population far exceeded the industrial, a large proportion of the women of the country were employed, as an accessory occupation, in the care of cows, pigs, poultry, and the handling of milk and its produce. The cultivated land was subdivided, under the lords, into very small parcels, and each tenant would graze a cow or two on the common land. Even yet in old villages one finds the remains of ancient farm buildings standing at frequent intervals down the length of the street. In listening to tales from the lips of old inhabitants, one commonly hears the descriptive touch—"they kept a few cows." In the small town near which I live, less than forty years ago quite a large number of people kept "a few cows," and it was quite a common sight to see these separate groups of cows come straddling leisurely along the street every afternoon, and disappear down a passage or into some byre-like building now transformed into a row of modern villas. A score or so of women in the town were expert dairywomen in their old-fashioned way. The era of the smallholder was the great day for women on the land. From the moment when the milk streamed from the cow's teats till it was marketed in some form, she had entire control of it; and very often she retained command of the money too, hoarded to pay the rent, or to maintain the household, as the necessity might be.

CAUSES OF FEWER WOMEN IN THE DAIRY WORLD.

As small holdings gradually combined, or were absorbed in larger, dairying became a more specialised occupation, and at the same time more arduous, and naturally fewer women were required to deal with the milk of a herd of 30 cows than with six lots of five. The introduction of improved machinery, and the progress of scientific research, made a still greater change in the position and number of women connected with dairying.

Improved machinery means fewer workers, and science—this is quite recent history—changed the old rule-of-thumb methods. Now

obviously, these changes were entirely initiated by men. Although it is women who have chiefly worked for centuries in the management of milk, butter, and cheese, it is not they who have invented the newest implements or the improved methods of handling the produce. And it is to the sciences of chemistry, bacteriology, and the physiology of diet in relation to milk production, that we owe the great advance in dairying in the last generation. Women have, as a result, been deposed from their old position of supreme authority, and although they have learned the results arrived at, their chief part has been to carry out the more technical processes which the exact science demands. Read through successive journals devoted wholly or partly to dairying, and note how few are the women writers. It is men apparently who study the many problems of the industry: the breeding of stock, the rearing of calves, the testing of milk, the improving of cheese manufacture, and numerous other important departments. A reader, ignorant of farm life, might think that women had no place here. Apart from the fact that they have taken hardly any part in scientific or practical research, it is true that the most experienced women, those who have managed their own farm dairies, have neither leisure for, nor practice in writing.

The change in the social habits of the nation at large has contributed to the comparative decline of dairying in Britain. In pre-war days, there was a very decided rise in the standard of living. Improved means of locomotion have created a desire for movement and change. In olden times—and not so very far back—one heard of farm women who never went anywhere except to church and market, and perhaps an odd day a few times a year to visit a relative, and whose whole life was spent in the home and the dairy, finding absolute contentment therein. But few of these remain. Now, dairy work is exceedingly binding. There is no entire day of rest in the week. Cheese in this respect is worse than butter, but everything connected with milk makes an imperious demand upon the time and attention of workers and supervisors. Hence, women who object to being constantly tied to the steading have a reluctance to engage in dairying. I have known herds to be dispersed because the life was too hard for the wife and daughters. It does not fall so hardly upon the men—in Scotland at any rate—because they must be free for markets, and auctions, and business generally, and the chained tyranny of it is unknown to them. Further on I shall have a few words to say on how this might be partly remedied.

THE MODERN DAIRYMAID.

The modern type of instructed dairymaid dates from the nineties of last century. In 1888 a committee was appointed to inquire into agricultural and dairy schools, with special reference to the latter, and although no recommendation was made in the report with regard to women, there was a great impetus given to instruction in all branches of dairying, and women benefited by it. It was about that year that the first travelling dairies were started in a few counties, and the modern

daïrymaid came into existence, teaching, lecturing, demonstrating all over the country. In the nineties the public flocked to these demonstrations as if it were a curious novelty to see a woman make butter. But in the official world this army of expert young women counted for very little, for in the next report (1907-1908) of an inquiry into the whole question of agricultural education, there was one paragraph mentioning the existence of two women's colleges, Swanley and Studley, founded in 1892 and 1898 respectively (only the first of which has a dairy course), and the word "women" occurs only twice again in the document. In short, as last year's report on the agricultural education of women points out, " . . . the system of agricultural education in this country has been built up mainly on the requirements of men."

Nevertheless, facilities for training female teachers in scientific methods of dairying—especially buttermaking, as that is simpler than the manufacture of cheese—increased, and concurrently there was the county council scheme for bringing the knowledge into the remotest rural districts. The writer can remember the time when in her district it was hardly possible to buy a decent pound of butter in a shop. Great quantities of it were habitually uneatable—I don't know who ate it. The bitterness of it was not surprising when one saw the damp half-underground milk-houses, used also as pantries for all sorts of food, and observed that there was not the faintest knowledge of ventilation. Frequently in winter cream would be kept for a fortnight before being churned. In early summer if the butter was bad, its rank taste was attributed to the presence of "ramps" (wild garlic) in the pasture. The strength and the extent of the prejudice against "new-fanglet" ways was formidable. I have known a woman refuse to have a thermometer in her dairy after her daughter had undergone some weeks' tuition at a farm school. And customers looked so suspiciously upon our butter made into blocks with the "Scotch hands" that we had to revert temporarily to the rolls. The travelling dairymaid, however, charmed the countryside, and conquered in the end. We have at least made a good beginning in correct methods of dairying.

TOO FEW INSTRUCTED DAIRYWOMEN.

It is only a beginning, however, for two weeks' course of elementary lessons is not sufficient to do more than instruct in the final processes of converting milk into butter, and giving a few general rules in the handling of milk that may be easily forgotten. Unfortunately, very few girls follow up this course by going to a farm school, where a longer course of six or eight weeks is offered. Out of all the tens of thousands of women and girls living on dairy farms in Britain, only about 400 each year receive instruction at farm or dairy schools. The mothers could help greatly by encouraging their daughters after finishing their general education to take a short course at such an institution. It is to be hoped that these will be largely increased in number, and that each county will be provided with at least one in which instruction will

be given most suited to the class of agriculture in that county. In other countries, notably Belgium and Ireland, it has been found that these farm schools are more attractive and have more beneficial results on farming life if domestic economy forms part of the curriculum. If a girl goes to a dairy school and learns new ways, there is a danger on her return either of friction with the mother, or, if she is keen on what she has been learning, she chafes at the restraint of home and leaves for an independent career. In most instances, that is not what is required. The great majority must through life combine a knowledge of dairying or some other minor branch of farming with the practice of housewifery. Curiously enough, the modern dairymaid has often a real distaste for cooking and housework. But the daughter of the farm should be expert in both, and if the mother knows of a school where both are taught, she will be the more ready to send her girl. There are certain classes of cooking peculiarly suitable for farms. The storing and bottling and preserving of fruit are very important where there is a farm orchard. One generation of properly instructed daughters would work a great improvement in the condition of British farming. Teachers of dairying are needed, certainly, but they exist solely for the benefit of the women who stay at home and put into practice what they are taught.

TUITION FOR THE MISTRESS.

The wives and mothers cannot leave their homes to go to a farm school. In few cases can they give the leisure to attend a course of itinerant lectures and take the class course. The unfortunate result is that, if they do not read technical journals, they cannot keep their minds in touch with the advances of agricultural science, nor even the improvements in their own departments. Canada and the States have a splendid organisation in the Women's Institutes for Farmers' Wives which have been successfully copied in Belgium and Denmark to the great benefit of agriculture generally. They were first started in Ontario in imitation of the farmers' unions; an association of farmers' wives for their mutual benefit and instruction. There are branch associations in each district, all under a central body which draws up schemes for their guidance, although they are left to work them out as best suits the character of the locality. Regular lectures, classes, and courses of instruction are brought within the reach of the most secluded, and the farm labourers' wives also benefit. In addition to instruction in dairying and management of poultry, they organise courses upon the hygiene, the cooking, the furnishing, and the lighting of the farm household. These institutes are partly subsidised by the government of the country, and for the rest financed by the membership fees. In many instances instruction is given free.

Often there is a library of books dealing with country life and work owned by the central association and sent out, 50 books at a time, to a given district. My experience of the wives and daughters on the farm is that they read hardly anything connected with their work. Even in the agricultural journals too many of them confess to reading nothing

but the woman's column, if there happen to be one. The knowledge, intelligence, and influence of the woman of the farm would be enormously increased if she could be taught to read the best books and journals treating of work and life in the country.

In an indirect way the scheme has got a start in England. The Village War Food Society suggested by the Board of Agriculture to encourage the cultivation of small gardens, allotments, and reclaiming pieces of waste land, has gradually been transforming itself into a copy of the Women's Institute: a movement which, we trust, will spread throughout the country.

THE TRAINED SERVANT.

One great drawback to the successful pursuit of dairy farming lies in the difficulty of procuring intelligent assistance for the mechanical part of the work. It is this which makes it such a slavish business for the wife and daughter. There is no source from which one can be certain of obtaining an intelligent servant who can be trusted entirely with the care of milk-vessels, the cleanliness of milk-house, and who could be left in charge occasionally under instructions. There is an odd one to be found now and again, but it is only by chance one alights upon her. The result is that far too much lies upon the one who is in charge. One woman told me she had never been away from the house—not even on a Sunday—for a day during the summer months in the height of the cheesemaking. She could not get a servant who was to be trusted, and five minutes' careless forgetfulness might spoil a whole day's cheese. There is great need for a specially trained higher service. This might be a branch on farm schools in large dairying districts. The dairymaid who has gone through a full course knows more than enough for the purely manual processes. What we require is a supply of superiorly trained servants who understand thoroughly all the rules of cleanliness in connection with milk and milk-vessels, and also know something of the washing and working of butter: the mechanical processes, the manual labour in connection with milk, butter, and cheese are not *unskilled*, and yet the master or mistress in charge of a dairy has to depend too often upon the assistance of a slovenly and untrustworthy servant. One properly trained could demand a good wage, but she would be worth it, and does not the very inferior one often demand a high wage—and get it? These superior dairy servants would, of course, have to be efficient milkers. The only reasonable way to conduct a dairy of any size is to have a skilled assistant so that the mistress shall not be a slave to a highly technical department tacked on to a household, she being responsible for both. This is quite common in the dairying districts of Scotland—that the wife makes the cheese which is exhibited at shows in the husband's name, and he gets the honour while everybody knows that the credit is due to the patient and slavish labours of the wife. Let her have good help!

THE WOMAN ON THE LAND.

Increased production means increase of labourers. Where are they to come from, and what inducement is there for them to leave the towns? Germany employs twice as many men as Britain for every 100 acres. Of women, permanent and temporary workers, she employs ten times as many as we do. This is owing to the greater porportion of small holdings on the Continent. Mr. Middleton, in his study of the Development of German Agriculture, says "It is the German small holding that keeps women on the land, and it is largely from these small holdings that the women on the larger farms are recruited." There are $4\frac{1}{2}$ millions of women employed on holdings of less than $12\frac{1}{2}$ acres. The number of our small holdings is trifling in comparison, so that we have not that experienced class of woman labourer to draw from. The wages also are much lower than we pay, not quite half. There is a passage in "*Elizabeth and Her German Garden*" where the authoress describes the uncivilised condition of the women, who come with their men in batches, from Russia and Poland, to work in the fields from March to December. A not uncommon incident is for a woman to leave the field and go to her hovel to have a baby, then return in the afternoon and begin digging again. In "*A Solitary Summer*" she describes the little village or row of houses where the workers on the estate live; an old woman minding the babies, while the mothers go out into the fields. It reads very much like a picture of the most wretched part of Connaught. We cannot increase our female labour supply on these lines even if falling behind in the agricultural race with Germany be the penalty. To be sure, there are large numbers of women in our rural villages who have been servants in their youth who might go out at certain seasons, and many of whom are responding to the patriotic appeal for help to secure the crops, but it is doubtful whether they will continue after the emergency passes. The next few years will reveal whether our present experiment in the way of training girls for general field and farm work will bear fruitful results. It is to be noted that we are moving in a directly contrary direction to Germany, most of whose women workers are of the lowest class and poorly paid. We give ours a distinctive dress, an honourable badge, and good pay. The next ten years will tell us something of results.

EDUCATED WOMEN.

Since the labour difficulty on the land became acute, a wide appeal has been made to the more educated women of the country to offer their services either for temporary labour, or for training in branches of regular farm work. It is idle to expect a permanent addition to the female workers from the educated classes. For manual labour that is purely a war emergency. A college education is not the proper preparation for weeding roots, feeding pigs, milking cows, and working horses; nor for any branch of dairy work but teaching, or the higher posts of management. Already for a great number of years, women with

university degrees, finding other professions overstocked, have qualified for dairy teachers and the higher posts on large farms or in institutions. Whether the attraction of farming pursuits is likely to draw in a larger number from the educated classes cannot be foretold. But a more important point is that there should be a larger proportion of the daughters of well-to-do farmers given the highest agricultural education the country affords. It is from these that we may expect the best results. The report of the Agricultural Education Conference recommends that at the existing colleges more facilities should be given for a systematic course to women in general agriculture. It is inadequate, for instance, that in dairying a woman's training should begin with the management of milk. She should receive the same instruction as men in the breeding and feeding of cattle, and all that concerns the production of milk. The technical processes are important, but not so important as the questions which govern the increase of milk at the lowest cost. We want the wives of the dairy farmers to be highly educated in the right way.

The provision of adequate facilities, suitable course, and scholarships, are necessary, but more essential is an enlightened ambition among the farmers' wives and daughters. I remember once going round the farms with a dairy instructress asking the girls to join a class. At one well-to-do yeoman's farm where there were several daughters, they smiled in a superior way and quite cheerfully said they would never dream of attending a buttermaking class. "But don't you make the butter?" I asked. "Oh, yes, they pounded it," they said, but that was all; they went into the dairy as little as possible, and took no interest in it. That is not the way to fight German agriculture.

The evidence of Miss Thomas, Head of the Department of Botany and Horticulture, Bedford College, is that the highest posts for women in the agricultural world are filled by women from the professional middle class, and that there are few who fulfil all the requirements. These women from an outside world lack technique, and the intimate knowledge of farming that can only be acquired by those living on a farm. On the other hand, those with practical knowledge lack scientific training or university education; which is evidence that the women from a farming family seldom go in for higher education. Not a surprising fact when one knows the conditions of farm life. Women are being employed in research work, though the openings are neither numerous nor well paid. Miss Thomas thinks that "it would be more profitable if the investigations were conducted by people who had some acquaintance with the farmer's side of the problem." Chemistry, biology, and bacteriology are subjects in which women might profitably specialise. It is desirable that there should be some women in every department of agricultural activity. It is not a right state of affairs if they keep out of the scientific world of agriculture and take no part in investigation. Professor Biffen, Professor of Agricultural Botany at Cambridge, does not warmly welcome women into the domain of research. He would choose a man in preference to a woman: . . .

went to their own sex. We do not want the woman's place to be entirely that of *handmaids* to the industry.

POULTRY KEEPING.

This is not dairying in the strict sense, but it is an adjunct on most dairy farms. We are realising now as we never could do from mere statistics how deficient is the home egg supply. With the best efforts we could not supply our own consumption, but there is a huge waste in the country from this source. Seldom does the farm know whether its poultry pays. It is not uncommon to see a goodly flock of fat, comfortable hens sunning themselves in the lee of a building on a winter's day, and to be told in reply to a query that they have not laid an egg for weeks. There is a tremendous loss in the hatching and rearing, too. There has been some improvement of late years, but there are few districts where proper methods of poultry-keeping are taught in the simple manner suited to a small run on a farm. Troublesome methods and expensive outfit frighten the farmer and his wife. Why could not we have the Irish scheme imported to England and Scotland? There is an instructor in each county who will visit any person who asks for her services. There are 1,600 poultry stations established throughout the country. A three-weeks' course of instruction is given each summer in different centres, and throughout the winter months private advice is given. As a result—I have not space to enter more fully into the scheme—Ireland's export of poultry and eggs has increased by hundreds of thousands of pounds yearly, and the industry is entirely in the hands of women. It is not large poultry farms which are needed to increase our egg supply, but the tens of thousands of small flocks to be managed intelligently on an economic basis. To this end we require instruction to be brought within the reach of all farms, small and large; instructions how to make the small flock pay, not in model houses with the newest appliances and under ideal conditions, but in the available out-buildings on an ordinary stead.

WOMEN UNDER BOARD OF AGRICULTURE.

When the war created an alarming shortage in labour for the land, an agricultural section, with women as organisers, was added to the Employment Department of the Board of Trade. Lord Selborne's scheme for placing women on the land is well known, and inevitably it had to be followed by various schemes for training women for the work. This in turn necessitated the engaging of the services of women advisors, of experience and knowledge, in the training of women in agricultural work. In the beginning of the year 1916 a new

post was created under the Board of Agriculture, that of "woman inspector" of the activities arising out of the canvass of women. At the present moment everything is subordinated to procuring women to take the place of men taken away under the Military Service Act. This special demand will pass, but it is to be hoped that the new dignity lent to work on the land will not pass, and that out of the present necessity will emerge a wide and efficient scheme for the education of women from the lowest to the highest branch of agricultural work. Why not a woman advisor for each important branch? The dairy industry in its relation to women, or vice versa, might engage the attention of a small staff of skilled and experienced women. We might with advantage borrow the idea of an Advisory Board of Women such as exists in British Columbia and Canada. Let there be a women's department for the dairy industry, to organise and improve the education of its women workers, from the skilled servant (who should qualify in milking, feeding of calves, and the laws of ventilation and cleanliness in the dairy) up to the university graduate who has learned all that theory can teach of milk production, and who is endeavouring to add to our knowledge. How the present system of education could be extended, how it could be brought to those who are unable or unwilling to go and seek it, how the conditions governing the life of women on dairy farms could be improved—these are some of the questions that might be seriously approached by the department set apart for the study of women's work in the dairy world. The Board of Agriculture is to be congratulated upon the very small beginning in seeking the advice of women in these matters, and one hopes it will have the humble wisdom to seek it more.

Exactly under what supervision or guidance the women's institutes are struggling into existence in this country I am not clear. There seems to be an Agricultural Organisation Society and a Central Committee of National Patriotic Organisations which have something to do with them. There would be a better chance of their more general formation if they were linked on to the existing Women's War Agricultural Committees. Where these have done useful work, they might continue in a new form after the war to promote a higher standard of education and co-operation among the women on the farms. This is not irrelevant to the question of progress in dairying, for after all, it is the very few who go out to schools or colleges, or even itinerant classes, or who get any systematic teaching whatever. The close and arduous nature of the duties render the life a very slavish one, and tend to make the women narrow and conservative in their outlook—not a hopeful state of mind for progress in any industry—and also have a marked tendency to discourage many from engaging in dairy farming. Mrs. Watt, Secretary to the Advisory Board of Women to the Department of Agriculture in British Columbia, who gave evidence before the Committee of the Agricultural Education Conference, said that the prosperity of the province was partly due to the women's institutes, which have both industrial and social value.

WOMEN IN ASSOCIATIONS.

There is yet another great defect in the position of women in the dairy industry. It is that they have no part in the counsels of the various societies into which farmers form themselves. They may be members of the B.D.F.A., but they are not elected on committee, they have no influence, and the fruits of their large experience are not made use of. The British Dairymaids' Association does useful work in its own domain, but it is only to a very limited extent it gets hold of the women on the farms, who are, after all, the most important. The British dairymaids are a goodly company, and it is right that they should have their own society, but dairying as a whole is carried on by women *and* men, working together in closest partnership. Men alone cannot carry on the dairying of the country—although to read through a whole Journal one would think that there was not a woman ever looked at a cow or handled a pail of milk—nor can they tell how the partnership of women could be utilised to the highest advantage. There is no man who will say that the woman's contribution is small. Is there one who would suggest that her voice on a conference or on a committee would have no special value? The Board of Agriculture has led the way by giving the Education Conference power to co-opt women members. But this elementary principle of just representation has not yet been even faintly grasped by the great body of farmers. They combine, and they confer, and they write as if dairying was entirely in their own hands, and purely under male control. And it is not so.

CONCLUSION.

It is easier to write of the place women have in the dairy world as it is than to suggest ways in which they may promote the advance of the industry in the future. To sum up, it is a question first of education: grades of education to suit the different classes of women who engage in dairying, and, above all, an education that will come right into the farmhouse and influence the minds of the wives and daughters there. The Germans themselves attribute the progress of their agriculture mainly to education. Professor von Rünke says: "The great progress that agriculture has achieved in Germany during the last quarter of a century is the result of the union of practice with science, and proves that money spent on research and on education in every class brings in a high rate of interest." The President of the German Agriculture Council wrote in 1914: "Finally, the development of agricultural education must be particularly mentioned as one of the more important of the various factors which have led during the past 20 years to the recovery of our agricultural system from the almost hopeless condition in which it found itself. For it is only by means of education that there is a hopeful possibility of bringing the important scientific and technical advances of the present age more and more to the notice of our millions of small farmers." That is the sure means whereby our women will put forth greater power to help. In the past they have been faithful drudges in the dairy world. No more can be

expected from them in that direction. But give them greatly increased opportunities of scientific education, and we shall see! And, added to that, let them have equal and honourable place beside men in all associations that concern the welfare of the industry in which they both labour with head and hands.

In the first year of war we were moved by a despairing admiration of the efficiency of Germany, and her thorough preparedness, and were too prone to contrast our own weakness and slackness with her strength. Another year, and we are told that we have a decided superiority over the enemy in guns and ammunition, in aerial service, and in defence. It will be the same in the province of agriculture. At present we are impressed by the superior organisation of our enemy in growing his own food. We were safe and rich in our island home, and we did not prepare for war. We got plenty of cheap food brought to our shores, and we did not trouble to grow more. But necessity has with incredible speed made us the foremost military nation of the world. The same necessity will stir us to outstrip the German production from the land. Our women are not so cheaply hired as the German, nor so thrifty as the French; but the war has proved that they are the most capable, the most enterprising, and the most resourceful of all nations. To the ends of the earth the great deeds of the British woman in serving her country and succouring our Allies are known and held in honour. Shall not our farming women do great things too in developing the resources of our agriculture?

FEEDING STUFFS.

By F. J. LLOYD, F.I.C., F.C.S., Consulting Chemist to the
Association.

"THE war has emphasised the need of greater home production of food. This is possible only by the greater application of science." Such are the opening sentences of a memorandum presented by Captain C. Bathurst, M.P., to the British Science Guild, as Chairman of its Agricultural Committee. Probably the same thought must have been in the minds of the Journal Committee of the British Dairy Farmers' Association when they asked me to write a paper upon the subject which forms the title to this article. In other words, they may have asked themselves this question: How is it possible for the farmer even to maintain his past output of milk and meat with Feeding Stuffs at the enormous prices now current? The answer to this question may be stated in general terms by the following propositions:—

1. Care must be taken to ensure that every article bought is genuine, of good quality, and up to the guarantee which under the Fertilisers Act has to be given by every vendor.
2. Some method must be adopted of comparing the relative cost of different foods which may be used for the same purpose.
3. Great care must be exercised in purchasing, so as to obtain the article best suited for the object in view, and not merely an article which appears to be relatively cheap. Such substances are often relatively dear.
4. Every article purchased or even employed must be used to the greatest advantage.

Let us now consider these propositions a little more at length. Unfortunately, in a short article it is not possible to enter into details.

1ST PROPOSITION.

Every article purchased must be of good quality and up to the guarantee given by the vendor. The Fertilisers Act has given to every farmer in the country an opportunity of ensuring that the substances he purchases are of a definite composition. Thus, the vendor must state on the invoice the percentages of oil and albuminoids present. The county councils, to provide farmers with the means of ensuring that every article they purchase comes up to the guarantee given, have appointed official agricultural analysts who make analyses for the farmer of any feeding stuff bought for a quite nominal fee.

Such has been the law for years past. Yet so lax have we been, both individually, collectively, and as a nation, that to-day it is not at all uncommon to find invoices which contain no guarantee at all.

If the farmer does not know that he should have a guarantee on the invoice it is inexcusable, and shows that he needs education. If he does know, and when he obtains such an invoice takes no action, he is, may be unwittingly, condoning an offence against the law. But what can one say of county councils and especially of the Board of Agriculture, who must frequently have had their attention drawn to this flagrant defiance of the law, and yet, so far as the writer can remember, there has not been a single prosecution for this offence.

The French have a saying: "God helps those who help themselves." There is not much chance of such help coming to the British farmer. The Fertilisers Act has been in force for 20 years. One may truly say rather that during that period it has been neglected. In the Board of Agriculture return showing the number of samples analysed under the Act in 1912, we find that there were only 1,500 of Feeding Stuffs. These figures speak for themselves. It may be suggested that farmers prefer to obtain analyses as members of some society to which they belong. We can easily test this suggestion by looking up the figures of the Royal Agricultural Society. In the year 1915 the Society had slightly over 10,000 members, and the total number of Feeding Stuffs sent for analysis amounted to 104. One can scarcely credit these figures. At a very low estimate we may assume that at least a quarter of a million pounds sterling was invested during the year in Feeding Stuffs by these members, and only 104 deliveries checked. The old motto of the Society surely ought to be changed, and in future read "*Practice without Science.*"

As consulting chemist to the British Dairy Farmers' Association I received last year only four samples of Feeding Stuffs for analysis.

All these figures prove that the farmers of this country have neglected to utilise even the opportunities they had, and have not checked the composition of their purchases as they should have. This must not continue. It has meant in the past an immense loss of money; it means to-day even a more serious loss.

It is difficult to account for this. Maybe the farmer thinks that to check the oil and albuminoids is not sufficient, and will not help him much in the use of the material. But even that explanation, while it is true, is not satisfactory, for it overlooks two facts, first, that the object of the Act is to ensure that he not only obtains the proper amount of oil and albuminoids, but also a genuine article, and, secondly, because the agricultural analyst generally makes a complete analysis which in many cases the farmer obtains. Even when this is not done under the Act it is invariably done by the consulting chemists to the various agricultural societies.

Hence there must be some other cause for farmers not using analyses, and probably it is that they do not know their value.

Every analysis of a Feeding Stuff to be of full value to the farmer should show first the three nutrients—oil, albuminoids and carbohydrates, which give a maximum value to the material; and, secondly, the three non-nutrients—moisture, woody-fibre, and mineral matter, which detract from and reduce the value of the nutrients.

It is essential for the farmer to realise that he cannot estimate the value of a food merely from its nutrients. Take, for instance, the nutrients in a cotton cake. They amount, say, to 60 per cent., but they are bound up, not merely mixed, with 40 per cent. of non-nutrients, and though chemical analysis may show 60 per cent. of nutrients, no animal can ever get that material out of it during its passage through the body. The amount of nutrients that will or rather can be obtained depends largely on the animal consuming the food, and partly on the state of division of the food when given to stock. Thus ruminants (cattle and sheep) can extract nutriment from foods containing an amount of woody fibre which would be injurious to other animals. Still, as a general rule, the finer food is ground the more nutriment can animals abstract from it. The horse affords a striking illustration of this. Unbroken oats will pass through the horse with very little of their nutriment abstracted, not so will crushed oats.

One of the main faults of analyses at the present day is due to the fact that the analyst is bound by the instructions of the Board of Agriculture to grind every Feeding Stuff until it passes through a sieve with one-millimetre holes (about 1-24th of an inch). This may show the total amount of oil present in the material. But that the oil so found can by any possibility ever be abstracted by an animal fed upon the material is quite another thing. All will depend upon the way in which the material is used.

The same holds good with regard to albuminoids. These are, like the fat, in some cases intimately associated with the woody-fibre, and most difficult to remove even when the material is given to an animal in a fine state of division.

Taking these facts into consideration, it is evident that the mere statement of the oil and albuminoids of a Feeding Stuff gives little indication of its feeding value. These figures are of value for checking the purchase of a substance; but for estimating its feeding value something more is required.

This variation between the amount of the food nutrients and their availability is not confined to foods containing woody-fibre. The hardness of a material such as a cake very greatly affects the amount of nutriment which an animal can take out of it. This is strikingly illustrated in such cakes as decorticated cotton, soya, and palm kernel, &c. I well remember going through the cowsheds of one of our members and pointing out that a very hard cake he was giving was not finely enough divided. He kept careful records, and at once said he would make careful experiments, as the point seemed new to him. Subsequently he informed me that the finer grinding had given marked beneficial results, and that he should never allow cake to be wasted again for want of the extra labour of grinding fine.

The harder the cake the finer it should be ground may be accepted as an axiom by feeders, and in days when labour is scarce and there is a tendency to save it, this fact especially needs remembering, for cakes are far too dear to waste in any sense.

There is no doubt in my mind that one great reason why decorticated cotton, soya, and many of the recently introduced newer feeding cakes having not attracted British farmers is mainly due to their hardness and the lack of the habit of giving such materials in a fine state of division.

It may be said that the digestibility of Feeding Stuffs has been worked out by some German and other investigators, and that these figures may be taken as a basis of calculation. I am not sure that they can. These figures are, as a rule, averages. If we study the subject a little in detail, we shall find that there have been very wide variations in the figures from which these averages have been calculated, that the digestibility varies considerably as to whether the feeding experiments were with horses, sheep, cattle, or pigs, and that there is very little evidence as to the exact condition of the materials when and as fed.

Moreover, there is the very practical difficulty that the majority of farmers have not these tables to consult, nor the time and experience necessary to use them. Hence we need a simple method of rapidly estimating how far indigestible matter militates against the value of the nutrients. I am inclined to think that if from the sum of the nutrients we deduct the woody-fibre or woody-fibre and sand combined, the resulting figure shows what proportion of the nutrients may be considered as certainly available. The following will illustrate my meaning. An earth nut cake and a cotton cake gave the following analyses :—

| | Earth Nut Cake. | | | | Cotton Cake. | |
|---------------------|--------------------|-----|-----|------|-----------------|------|
| Oil | ... | ... | ... | 6.9 | ... | 5.1 |
| Albuminoids | ... | ... | ... | 44.4 | ... | 19.4 |
| Carbohydrates | ... | ... | ... | 22.6 | ... | 34.9 |
| Total nutrients | ... | ... | ... | 73.9 | ... | 59.4 |
| Woody-fibre | ... | ... | ... | 10.7 | ... | 22.0 |
| Available nutrients | ... | ... | ... | 63.2 | ... | 37.4 |

Thus, in the earth nut cake 73.9 parts of nutrients are diluted with 10.7 fibre, while in the cotton cake 59.4 nutrients are diluted with 22 of fibre. It is self-evident that the nutrients in the latter could not be nearly so available as those in the former, but it is difficult to estimate to what extent. Meantime my suggestion would at least help farmers to compare different foods.

2ND PROPOSITION.

Every shilling laid out on purchasing Feeding Stuffs must be spent to the greatest advantage. It is easy to lay this down as an axiom, it is far more difficult to show how it may be carried out in practice. Undoubtedly, this idea is at the root of that baleful custom of buying what is cheap, by which is meant what costs little. But an article is not cheap because it costs little, it is only cheap if the nutriment it contains costs less than the same amount of nutriment in

Probably one reason why farmers purchase low-priced articles is due to the difficulty they have in determining whether a higher-priced article is worth the extra money. And the question: "How can a farmer determine the relative money value of different Feeding Stuffs?" deserves careful consideration.

For the purpose of illustrating the most usual methods of determining the relative cost of different articles of food, let me take two substances recently sent me for analysis. *A* was an earth nut meal, one of the foods recently introduced into this country. *B* a maize gluten meal. The composition of these substances was as follows :—

| | | | | | | | | |
|------------------|-----|-----|-----|-----|-----|-----|-----|----|
| *Containing sand | ... | ... | ... | ... | 2.7 | ... | ... | .6 |
|------------------|-----|-----|-----|-----|-----|-----|-----|----|

The Food Unit method: Based on scientific data, which need not be now entered into, it has been found that 1 lb. of oil or 1 lb. of albuminoids have each as much value as $2\frac{1}{2}$ lbs. of carbohydrates. If, then, we multiply the oil or albuminoids by $2\frac{1}{2}$ we get their equivalent expressed as carbohydrates, and as one part of carbohydrates is taken as unity, we get what are termed the food units contained in the material. Thus A will give the following figures:—

| | |
|--------------|-------|
| Total | 161.2 |
|--------------|-------|

This cake was sold at £14 10s. per ton, i.e., 290s., so that if 161 food units cost 290s., then one food unit cost 1s. 10d.

B will give the following figures :—

| | | | | | Per cent. | Food units. |
|----------------|-----|-----|-----|-----|----------------------------|----------------|
| Oil | ... | ... | ... | ... | $4.6 \times 2\frac{1}{2}$ | = 11.5 |
| Albuminoids... | ... | ... | ... | ... | $20.6 \times 2\frac{1}{2}$ | = 51.5 |
| Carbohydrates | ... | ... | ... | ... | 54.1×1 | = 54.1 |
| Total ... | | | | | ... | <u>117.1</u> |

This meal was sold at £11 2s. 6d. per ton, *i.e.*, 222.5 shillings, so that if 117 food units cost 222.5 shillings, then 1 food unit cost 1s. 11d.

Thus *B* which costs £3 7s. 6d. a ton less than *A* is really the dearer food, for its 117 food units cost 117 pence, 9s. 8d., more than the same number of food units in *A*.

It must not be supposed that *A*, although a cheaper food in the true sense than *B*, could therefore replace *B* in actual feeding practice. Many other factors have to be taken into consideration before one could decide that. My object is simply to point out the *method* of comparison. The farmer before he utilises this method must make up his mind as to what foods he might use for the purpose he has in view, and then set to work to compare them.

A very simple method of comparing Feeding Stuff's of the same nature, but one not suitable for comparing quite different varieties of material, is given by an American author in a recently published book.*

He calculates the digestible protein and the total nutriments in 100 lbs. of each food, then takes the cost of this 100 lbs., and determines what 1 dollar will purchase.

I do not consider the ordinary farmer can be expected to discover by calculation the amount of *digestible* protein present in an article he thinks of purchasing. This is book-farming, very pretty in theory, but of very little practical value. We have already seen that the farmer can rarely find out, prior to purchase, even the percentages of the nutriments, much less the amount of these which is digestible.

But assume that he can discover the percentages of oil, albuminoids and carbohydrates, as in the preceding cases, then the calculation would be as follows :—

| | Albuminoids. | Nutrients. | Cost. |
|---------------------------|--------------|------------|----------|
| 100 lbs. <i>A</i> contain | ... 46.9 | ... 79.5 | ... 13.2 |
| 100 lbs. <i>B</i> contain | ... 20.6 | ... 79.3 | ... 10.1 |

To obtain the cost of 100 lbs. it is simply necessary to divide the cost per ton by 22 which gives a result near enough for practical purposes. From these figures we can easily determine what 20s. will buy in each cake. A simple calculation shows that :—

| | Albuminoids. | Nutrients. |
|----------------------------------|--------------|------------|
| 20s. worth of <i>A</i> contained | ... 71 lbs. | ... 120 |
| 20s. worth of <i>B</i> contained | ... 41 lbs. | ... 158 |

* "Principles of Feeding Farm Animals." By Sleeter Bull. London, Macmillan & Co. 7s. 6d.

Here it is evident that the two materials are not interchangeable; that *A* is a food supplying much albuminoid nutriment, and suitable mainly where this is needed. Taking into consideration how expensive albuminoids always are as compared with the other nutrients, it is evident that 20s. worth of *A* is superior food to 20s. of *B*.

But as stated at the outset this method is best applied to materials of a similar nature.

Thus we may legitimately compare one cake with another by this method, and the following serve to illustrate both the method and some general principles. Their analyses gave:—

| | | | | | Linseed Cake. | | Compound Cake. |
|---------------|-----|-----|-----|-----|------------------|-----|-------------------|
| Oil | ... | ... | ... | ... | 11.2 | ... | 8.2 |
| Albuminoids | ... | ... | ... | ... | 31.2 | ... | 18.8 |
| Carbohydrates | ... | ... | ... | ... | 27.2 | ... | 42.6 |
| Price per ton | ... | ... | ... | ... | £12 | ... | £11 5s. |

From the above a simple calculation shows that—

| | | Albuminoids. | Nutrients. | | Cost. |
|----------------------------|------|--------------|------------|-----|-------|
| | | | | | s. d. |
| 100 lbs. Linseed contained | 31.2 | ... | 69.6 | ... | 10 11 |
| 100 lbs. Compound „ | 18.8 | ... | 69.6 | ... | 10 3 |

Here it is very evident that the compound cake is worth very much less than the linseed cake, for it contains only the same amount of nutrients, but 12 lbs. less albuminoids per 100 lbs.

Readers might with advantage make some of these calculations, and they would often find that some cakes are dear in proportion to the nutriment they contain, and also that some of the cakes to which farmers are wedded from custom are not worth the money paid for them.

It may be contended that there is no reason why farmers should go to the trouble of making these calculations, because books are published which give the average composition and food units, &c., of various Feeding Stuffs. These books have their use, but what they do not do is to help the farmer to estimate the value of the particular cake or other Feeding Stuff which he purposes to buy or has purchased. The farmer must depend upon himself, not on books, and my object is to put into his hands a simple method of estimating the relative market values of substances. Thus only can he insure that every shilling laid out on Feeding Stuffs has been spent to the greatest advantage.

So far, we have considered those articles which have been bought, or are going to be bought, and have assumed that the farmer knows the percentage of nutrients they contain. Now let us consider the position of the farmer who wishes to buy Feeding Stuffs and would like a guide as to their probable price. He will know from experience what kind of food is required, and there may be several articles on the market either of which would serve his purpose. If he is a wise man and takes in the *Journal of the Board of Agriculture*—which costs only 4d. a month and is a storehouse of the most valuable information—he can soon find what he seeks. Each month in this *Journal* are

published "Notes on Feeding Stuffs," which are compiled by the Animal Nutrition Institute, Cambridge University. In these Notes he will find tables showing the price of the food unit in all the principal Feeding Stuffs. I have before me these prices for January, 1917, it will be interesting to quote a few, for they may show readers what care should be taken in the selection of foods purchased and what a saving can be made by judicious selection.

January, 1917.—London.—Prices per food unit :—

| | s. | d. |
|---------------------------------|----|----|
| Earth nut cake* | 2 | 7½ |
| Decorticated cotton cake | 2 | 11 |
| Cocoonut cake | 3 | 2½ |
| Palm kernel cake | 3 | 3½ |
| Linseed cake | 3 | 4 |
| Cotton cake, Egyptian | 4 | 5¾ |
| Cotton cake, Bombay | 4 | 8¾ |

These figures speak for themselves. They enforce a view I have long held that farmers are unwise in their universal belief in ordinary cotton cake. From a feeding point of view it is poor in nutrients, always very dear relatively, and it contains a large amount of indigestible fibre which is more frequently a source of trouble than is generally realised. Cotton cake has, of course, a special value on certain land and at certain periods of the year, on account of its astringent properties, but, considered simply as a source of nutrients, it could frequently be easily replaced to advantage.

3RD PROPOSITION.

When purchasing a Feeding Stuff obtain the article best suited for the object in view.

For many years past experiments with various Feeding Stuffs have been made at our Agricultural Colleges and especially abroad in the United States and on the Continent to discover what may be termed the individual characteristics of each Feeding Stuff. The war has given a new interest to these experiments, because many Feeding Stuffs hitherto neglected in this country, not so much from ignorance as from our foolish conservatism, have been under observation and test. These experiments have conclusively proved that certain foods have a marked influence for definite purposes. It will be sufficient to mention two well-known examples, the marked effect of brewers' grains upon milk production, and the undesirable effect of maize in the feeding of pigs.

4TH PROPOSITION.

Every Feeding Stuff purchased or employed must be used to the greatest advantage. Herein lies the whole art and science of feeding, and to fully develop the subject would require a work on the feeding of animals rather than a short article.

According to my experience the chief faults in feeding are three in number. The first and most common is that too much food is given,

* This is quoted as ground nut. I always prefer the older term earth nut, as the other leads to misunderstanding and sometimes fraud.

so that the maximum return is not obtained at the minimum of expenditure.

The second is that at certain periods of the year and in certain districts dairy farmers especially fail to realise the natural poorness of the grass or its substitutes, and do not give a sufficiency of nutriment, sometimes as regards quantity and sometimes as regards quality. And the third fault is that when purchasing Feeding Stuffs sufficient care is not taken to select a substance which makes up for the deficiency in what is generally the home-grown food.

It will not be possible to deal with these three faults in detail. There are, however, some general principles which may be worth a little consideration.

The Vernon Experiments carried out by the Association, now many years ago, proved more conclusively than has ever been shown that cows will thrive and give their maximum quantity of milk on far less food than they would consume if allowed to. Now, is this their nature or is it dependent on the food? In other words, are they like children who, if given bread and butter only, are not likely to over-eat? but put before them sweets and cakes and highly-spiced buns, and the majority will certainly take far more than is required for nutriment.

We may look upon grass as the bread and butter of the cow. If able to, will she eat more than is necessary for nutriment? If the answer is in the affirmative, then I fear we are not making the best use of our pastures in this country, and those who advocate the system of "soiling," or cutting the grass and giving only a limited quantity to each animal, might well study this question. Of course, it may be said that if sufficient cows are turned into a pasture they could not obtain too much food. But in such case the pastures would need to be proportioned to the herd and either equal in size, or, at least, in food production; but these conditions seldom exist.

If, on the other hand, it is maintained that cows would not over-feed on grass, then it is evident that in stall feeding the artificial Feeding Stuffs employed excite the appetite, and so induce a waste where its possibility is not checked. Such being the case, are the highly-spiced cakes and meals, so largely advertised and used, quite so valuable as they seem? They have their use undoubtedly, and may help a shy eater to take sufficient food, and food which might not otherwise be palatable. But they are a possible inducement to waste, and hence need judicious use.

As regards the underfeeding of cattle, this in the past has been far less frequent than overfeeding. Yet many cases have come to my knowledge, probably because they have resulted in the owners getting into trouble, and having sent me the milk for analysis, have then consulted me as to the cause of its abnormal composition. It must not be forgotten that to the public analyst an abnormal milk is always an adulterated milk. Hence the numerous prosecutions which have

been taken against farmers who have innocently and unknowingly sold abnormal milk.

These abnormal milks may be produced as the result of many causes, amongst which are undoubtedly underfeeding, and injudicious feeding, which fails to supply some necessary nutriment or supplies one nutriment in excess. The conditions which are likely to prevail in this country for some time to come will tend to induce underfeeding and injudicious feeding, and these faults will need to be specially guarded against. Underfeeding is most marked when cows are put on pastures too early in the season, or when there happens to be an excessively rapid growth, or, lastly, in the late summer or early autumn, when there is or has been a drought. It is sometimes, but less rarely due to the excessive use of food which while stimulating milk secretion fails to supply the necessary nutriment itself, and is not supported by food which does supply that nutriment.

Then there are cases, and these are far more common than one would suppose, where owing to the high cost of foods rich in nitrogenous constituents, *i.e.*, albuminoids, and the comparative cheapness of foods rich in carbohydrates (starch, &c.), these latter have been given in excess and the former not in sufficient quantity. In such cases the milk yielded is frequently abnormal, more especially deficient in fat. The explanation is simple, and has been confirmed by farmers many times. Such food induces the animals to fatten, they get into good condition from the butcher's point of view, which is generally bad condition from the milk producer's point of view, and also from the public analyst point of view, as the owner may soon find to his sorrow.

There has been far too much talk about not being able to alter the composition of milk by means of the food. All sorts of experiments are made and quoted as proving this fact. It is one thing to carry out an experiment, it is quite another to rightly interpret the results obtained. Some of these experiments neither prove nor disprove the conclusions drawn from them, and this has frequently been the case with those supposed to prove that food does not affect the composition of milk. If cows are given a sufficiency of food properly balanced as regards its constituents it is generally true that no matter whether those constituents are given as A, B or C cakes, or D, E or F meals, or any satisfactory combination of them, other factors being common, the composition of the milk will not vary. And naturally so, for it will be the normal production of properly fed cows.

It is the improperly fed cow that gives abnormal milk, and to say that food does not affect the composition of milk is to flout erroneous theory in the face of Nature which annually proves that cows can and do give abnormal milk as a result of insufficient or unbalanced food.

If, then, overfeeding is wasteful and underfeeding injurious to both an animal and its produce, what is correct feeding? It may be summed up in one sentence, but in that sentence there is a vast store

of combined practice with science, and it needs many long days of study to master its meaning. Correct feeding is to supply an animal with food suitable to its digestive organs; in sufficient bulk where bulk is necessary, and sufficiently concentrated where quantity is not necessary; to ensure that the food contains sufficient digestible dry matter for the functions of the animal; and, lastly, that such dry matter contains albuminoids and carbohydrates, including fat, in proper relation to each other, *i.e.*, well balanced, and every care should be taken to see that well-balanced rations are given to stock.

It is only after the farmer has, by careful study, mastered the full meaning of the above sentence that he can hope to make the maximum and best use of feeding stuffs.

Note.—The prices quoted in this article were actually paid, but do not represent either present prices or average pre-war prices.

THE ECONOMICAL FEEDING OF PIGS.

By GERVAISE TURNBULL, F.L.S., Late Agricultural Instructor
for Wilts County Council.

Pigs are proverbially thrifty animals, and turn their food to good account at all stages of their existence. But their capacity for doing this varies much with their age and treatment, and there is not the slightest doubt that much loss must arise from the ignorance which prevails in this matter. Growth is rapid, and appearance is often deceptive, and so we find the strange anomaly of experienced pig-feeders being deceived as to the important question of when it pays best to sell, though they possess shrewd knowledge of the relative value of different kinds of food and management.

Early maturity is advocated on grounds of public taste or rapid turnover, but it has a further significance, since it means better value for money, and this in two ways: the rate of increase is greater, within limits, from younger pigs, and they return more for the food supplied.

The time when the rate of the former falls off has been put at about 7 score, but this is not invariable, as experiments show, and is referred to later; and it would seem that the latter point was a fairly obvious deduction to arrive at, considering that the food consumed increases with increasing size and age, which are obvious enough.

Men of experience, however, will bear out the writer in saying that the opposite belief prevails, and in consequence pigs are often kept to weights that are very uneconomical from the feeding standpoint, and apart from the smaller price per pound obtained.

The delusion is one of the eye and not of the scales, and a little knowledge of the composition and physiology of foodstuffs is a useful guide here. It is now well recognised that fats go much further than other foods in the return they give, and as the increase in fat pigs is largely fat it is reasonable to suppose that this is harder to produce than lean meat, it is certainly a more expensive business.

This is not the only reason for the change which takes place in the pig's output, but it suggests the value of a good food of a somewhat oleaginous nature during the later stages of fattening, but not in the earlier, if such can be found to meet the pig's requirements, and at a fair price.

RETURN FOR FOOD SUPPLIED.

This matter has been so clearly proved by experiment that doubt should by now have been laid to rest. However, it has not, and as pigs undoubtedly differ in their performances in this respect, as in others, it may be of interest to quote some figures which do not leave the matter in doubt.

The following table was some years ago drawn up from the Copenhagen experiments in illustration of the range shown by pigs of all weights which are here shown also approximately in scores :—

TABLE I.

| | 35 to 75 lbs. | 75 to 115 lbs. | 115 to 155 lbs. | 155 to 195 lbs. | 195 to 235 lbs. | 235 to 275 lbs. | 275 to 315 lbs. |
|--|------------------|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Average weights in lots scores | 2-4 | 4-6 | 6-8 | 8-10 | 10-12 | 12-14 | 14-16 |
| Average feed required to produce 100 lbs. gain lbs. | 376 | 435 | 466 | 513 | 540 | 614 | 639 |
| Average 512 lbs. | | | | | | | |

They represent a compilation from 63 very carefully carried out experiments, and, it will be seen, show 70 *per cent.* difference between the extremes of 2 and 16 score, in the amount of food required to produce 100 lbs. of gain in live weight, the food being grain or equivalent. It is seen that the variations in this quantity show some tendency to be more marked up to 6 score than over, though this may be denied by some feeders, also between 11 and 13 score, whereas in the Rothamsted experiments on pigs between 7 and 14 score the greatest difference occurred between 10 and 11½ score, and the least at about the stage which shows the greatest difference in the table above, after the initial stage was passed. As in other trials they vary widely, and, it would seem, afford little guide of a direct nature to the feeder; but the general trend is quite clear, and all agree significantly as to the net result of delayed maturity. The Rothamsted trials show, for example, over the whole period of fattening a range of 60 *per cent.* in food required for as little as 7 score increase, as against 35 *per cent.* in the above table for the same weight of pig and of increase. Again, the West of Scotland trials for 1905-10 show a 50 *per cent.* range for pigs between about 6-11 score, whereas the range is just about 20 *per cent.* for the same weights in the above table, and is, possibly, 30 at the Rothamsted rate.

With younger pigs Leeds University (1914) showed a range of 62 *per cent.*

The results of American experiments with over 2,200 pigs at more than 500 trials show a somewhat smaller consumption of food than the Danish, with a slightly wider range in weight, 15-50 lb. pigs requiring 293 of food for 100 increase, and 300-350 lb. pigs using 535. The latter gained 1.4 lbs. per day and ate 7.5 lbs. of food, while 250-300 lb. pigs gained 1.5 lbs. and ate 7.4 lbs. ("Henry's Foods and Feeding," 10th ed., p. 502.)

NEED OF BALANCE IN FEEDING.

Age apart, the character of the feeding is largely responsible for the amount of food required. There is no doubt of this in regard to other live stock, and the table on next page shows how far the same truth applies to pigs :—

TABLE II.

| Approximate Live weight in Scores at Start and Finish | No. of Pigs. | Food. | Per cent. Car. case. | Nutri- tive Ratio. | Weekly gain in lbs. | Food to 1 gain | | Profit per Pig. | In- creased Profit. |
|---|--------------|--|----------------------|--------------------|---------------------|----------------|-------------|-----------------|---------------------|
| | | | | | | Live weight | Car. case. | | |
| *6 to 11-12 ... | 8 | Maize and gram, 2 to 1 ... | 80 | 1-7 | 6 | — | 5½ | s. d. 8 3 | s. d. — |
| Ditto ... | — | Ditto and fishmeal, ½ ... | 80 | 2½ | 7½ | — | 4 | 11 9 | 3 6 |
| *4-5 to 11-12 | 16 | Mixed corn, nearly all maize ... | 77 | 11 | 8 | 7 | 5½ | 13 1 | — |
| Ditto ... | — | Ditto and fishmeal, ½ ... | 77½ | 6 | 10½ | 5½ | 4½ | 25 3 | 12 2 |
| *6 to 13½ ... | 8 | Barley meal and middlings, about 2 to 1 ... | 78½ | 8 | 9 | 5½ | 4½ | 12 9 | — |
| *4 to 7½ ... | 6 | Ditto (English) and boiled potatoes, ½ & ½ ... | 75½ | (?) 100 | 4½ | 14 av. | { 12½ 10 | 7 7 | — |
| *4 to 7½ ... | 6 | Ditto (Foreign) and boiled potatoes, ½ & ½ ... | 74½ | (?) 100 | 5½ | | | 11 3 | 3 7 |
| †2½ to 12½ ... | 4(?) | Maize and gram, 1 to 5 at start, 1 to 1 at finish... | — | 5 | 9 | — | 3½ | — | — |
| †1½ to 8 ... | 4 | Ditto ditto ... | — | 5 | 5½ | — | 3 | — | — |
| †7 to 14 ... | 16 | Barley and pea meal, 8 to 1 ... | — | 8½ | 14 | — | 4½ | — | — |
| § | — | Meal only ... | — | — | 5½ | — | 43½ | — | — |
| §5-6 to 10½ ... | (?) 75 | Ditto average of 3 sorts, and whey ... | — | — | 10 | — | 43½ | 1 2 | 2 yrs. av. |
| †1½ to 9 ... | 10 | Wheat offals, &c., and pea meal, 2½ to 1 ... | — | 5 | 7 | — | B4 | 12 3 | 5 expts |

(a) Dry matter: Barley meal and a little bran.

(*) Seale-Hayne Coll. Experiments, 1913.

(†) Rothamsted.

(‡) Leeds University, 1914.

(b) Dry matter.

(†) Cockle Park, 1913-14.

(§) West of Scotland Agric. Coll. Bull. 57. Weights at

first and last "periods" of feeding.

The figures tend to show that balance in feeding is required to get the best results. It is significant, however, that there is little or no difference in the *rate* of increase in the first example, owing to the albuminoid ratio being so materially altered by doubling the fish meal that the proportion of nitrogenous to non-nitrogenous food is much too high, and within much the same limits this form of waste, so often seen, was conclusively proved at Rothamsted in another experiment (full-grown pigs), when every sort of ratio gave practically the same resulting gain. Reference to Column 8 indicates that such excess does not imply a waste of protein as such, as some argue, but that it is not the best management financially. The higher gain all round in the second example may be put down, perhaps, to the extra food which they consumed.

With growing pigs a narrowing of the albuminoid ratio may mean in addition, however, a material increase in the proportion of lean meat, a matter of commercial importance, and 1 to 5 or 6 are sound limits. It is noticeable that albuminoid ratios of 1-8 and 1-8½ with older pigs gives about as good all-round results as lower ones. These are in effect a little narrower than the figures indicate where barley meal is concerned, because pigs have been found to be specially capable of digesting its albuminoids. This, no doubt, helps to account for the good results sometimes accruing when the ratio is wider than that accepted as standard for growing pigs. A fair proportion of protein may tend to sharpen the appetite, as well as help digestion.

Another point which emerges from these and similar figures is that the greatest increase in a given time is not necessarily dependent on obtaining the highest rate of return from food supplied, though the co-relation would seem to obtain fairly generally—and with a big turnover in pigs it is possible that regard to the former point only might sometimes be the more profitable. The value of peas and gram, especially for growing pigs, is also seen.

Old pigs, however, do not appear on the whole to give a heavier increase than younger ones (the Rothamsted pigs, for example, were at their maximum at 10 score, and then rapidly fell off), and the case against heavy weights, except in special circumstances, seems in every way sound.

PERIOD OF GREATEST INCREASE.

As to the weight at which pigs fall off in increase, 10 score live weight is, perhaps, the fairest estimate, varying considerably with the feeding, and heavy weight pigs seem to fare no better in this respect than those which have been pushed on from the start, though the actual drop—owing to larger frames and larger weekly gain of those put up later in life—may be less than in the more ordinary weights.

The West of Scotland trials with over 150 pigs, with animals weighing up to 11½ and 12 score live weight when killed, indicate a fairly uniform increase from 5 to 10½ score, and sometimes higher, but a careful study of the figures shows some tendency to greatest

increase in the second period of fattening, *i.e.*, with pigs in the neighbourhood of 8 score live weight (a figure which points to the profitable nature of the present light weight baconer), while one series of the experiments points to a progressive increase almost throughout, and especially at the last stage. But, subject to markets, 10 score is a very useful limit.

RELATION OF FOOD TO INCREASE.

These valuable tests show us also that the amount of food required per pound increase is by no means *necessarily* the highest in the last period (this is clearly seen in 9-10½ score pigs), and that this amount shows the sharpest *increase* as a rule between the first and second periods, thus agreeing to some extent with Table 1. This variation depends much on feeding however, and further, as one period sometimes makes up for another, reliance cannot be placed upon it. Trials even show that for weeks together, even at high weights, no more food for increase may be required than in a previous stage; it may even be less, with a larger live weight increase in consequence. But, as Table 1 shows, this is exceptional, and up to 10 score at any rate appetite increases, while it is, perhaps, the favourable intervals mentioned which help to foster the popular belief referred to at the beginning of this article.

WEEKLY GAIN.

For pigs of ordinary weights it would seem that 10 lbs. a week increase, over a period of about 16 weeks, is seldom exceeded, and how much this is dependent on feeding, Table 2 shows. The Rothamsted pigs, however, averaged 14 lbs. over 10 weeks, with a maximum of 17½ lbs., but beyond 10-11 score the waste would seem to be very serious, and not commensurate with cost of production.

LIVE WEIGHT AS A GUIDE TO FOOD REQUIREMENTS.

It is sometimes urged that live weight should be the basis of the amount of the food fed, and were this adopted it would be seen that the case against the heavy pig, though serious, is somewhat apt to look worse than it is. The reason is simple, and arises from the fact that such is the rapidity of the growth in the pig, he differs markedly from other animals in his food requirements per live weight. These diminish regularly and significantly with increasing weight, and since the pig requires more upkeep as he gets heavier the greater cost of the carcase increase is intelligible enough, but this is no valid reason for the popular delusion, which tends, broadly speaking, to much unnecessary waste and disappointment.

Table 3, worked out from the Cockle Park experiments of 1913-14, brings out the live weight requirements, and these agree generally with the Wolff-Lehmann standards, which harmonize well with good practice with other classes of livestock.

TABLE III.

| Food Consumed. | Av. Weight per Pig end of Month. | Live weight per 3 of Food used. | Food per 100 Live weight. | | |
|-------------------------|--|---------------------------------------|---------------------------|------------------------------------|--|
| | | | Cockle Park. | Leeds Univ. (tri- weekly) | Roth- hamsted (fort- nightly) |
| Lot 1. | | | | | |
| First month ... 1½ lbs. | 48½ lbs. | 99 | 3 | 4 | — |
| Second „ ... 1¾ „ | 64¾ „ | 110 | 2¾ | 4½ | — |
| Third „ ... 2½ „ | 87½ „ | 110 | 2¾ | 4½ | — |
| Fourth „ ... 3 „ | 120½ „ | 120 | 2½ | 4 | — |
| Fifth „ ... 4½ „ | 154 „ | 106 | 2⅞ | 3⅞ | — |
| Lot 2—Older Pigs. | | | | | |
| First month ... 3 lbs. | 76 lbs. | 76 | 4 | — | 5¾ |
| Second „ ... 3¼ „ | 101 „ | — | — | — | 5¼ |
| Third „ ... 5¼ „ | 152½ „ | 87 | 3¾ | — | 4½ |
| Fourth „ ... 7 „ | 209 „ | — | — | — | 4 |
| Fifth „ ... 9 „ | 246½ „ | 83 | 3⅝ | — | 3¾ |

Lot 1 weighed 30 lbs., and lot 2, 48 lbs. at the start, and the food to live-weight increase was 3 and 3 $\frac{1}{2}$ to 1 respectively, showing how small this proportion is when right feeding is adopted, and how the latter, along with early maturity, makes for economy, the pigs being fed throughout on the standards just mentioned. Indeed, scepticism was expressed locally as to the adequateness of the ration, which was fed cold, with water. Further particulars appear in Table 2. They show clearly the value and healthy nature of pulse for little pigs in the absence of milk, and illustrate the comparative unimportance of fat in the young pig's dietary. The Rothamsted and Leeds figures are included in the last column in the table, and the latter testify, similarly, to the value of peas—and this in the absence of any appreciable quantity of other meal—when growing fatteners are concerned. The Cockle Park figures show that about 3 $\frac{1}{2}$ lbs. of food per 100 live weight is required by a pig of 170 lbs., while Leeds show slightly less, and the other figures show more divergency from standard, but the downward tendency is clear.

A useful guide to correct feeding is thus afforded when mixing, say, a pail of food.

Live weight is a useful test of vigour, and the heavier store pigs of a lot, being more thrifty, like the pigs of large litters, would appear to put on weight quicker than slightly lighter pigs in the same way or they “die” better. The Seale-Hayne figures indicate a fairly general tendency this way, though certainly with exceptions up to about 30–35 lbs. of increase, and this may exceed their original extra weight.

Carcase weights sometimes reveal the pig's economy in a truer light, and it was seen in the case of Soy cake and of English and foreign barley (see Table 2), where about 1 per cent. in proportion of carcass separated the lots. There is certainly a connection between a

sound food and a good percentage of carcase and weekly gain, and the Scotch experiments show how closely the most productive foods, as regards increase for food supplied, coincide with a high percentage of carcase. The Seale-Hayne pigs fed on nearly half potatoes realised no more than 75½ per cent., while barley meal and sharps gave nearly 79 per cent. and double weekly increase, and weight is generally, as remarked, an important factor here. As much as 4 per cent. extra carcase between 12 and 15 score has been found, bringing the latter to 84 per cent.

The pig is, in short, a producer of the best type, the essence of concentration and economy, always ready to show a profit; and he is for this reason often the worst treated animal on the farm. These characteristics, it is well to add, are at their best when pigs are fed on highly digestible and concentrated food—corn. Roots are fairly useful, but if fibrous food in the shape of green fodder is to be his diet, as it is to be hoped it may be more largely in future, equally good results cannot and must not be expected, as American results show.

In conclusion, the gist of the foregoing may be briefly summed up in early maturity and a well-balanced diet, but the writer would here enter a plea for further experiment and on simpler lines. On such simple matters as the best way of treating food, and the best proportion in which to mix even the commonest kinds, it is to be feared there is much ignorance and uncertainty prevailing, which is difficult to dissipate in the absence of direct experiment; and these have been fewer with the pig than with other animals.

To give an instance, the experiments referred to in Scotland with barley meal mixed with water gave such bad returns that they were subsequently abandoned, but large numbers of feeders have no other medium than water, and the results seem at variance with experience. The very marked inferiority of this food to maize, although at a low price, suggests much loss at present prices if the conclusions arrived at in Scotland hold good elsewhere. Again, such simple matters as heating food, as distinct from cooking it, and the feeding of meal wet or dry, have not been thrashed out, yet appear from time to time to have considerable influence, and at least may sensibly affect the outlay in labour.

THE TABLE FOWL OF THE FUTURE.

By JOSEPH PETTIPHER, Woodway House, near Banbury.

THE increased amount of interest taken by almost all classes of the community in the various ways and methods of improved and increased poultry culture during the past couple of years has been unprecedented, and it is probably correct to say that in the majority of cases the leading notion has been increased egg production, but at the same time, though perhaps less ostentatiously, there have been many workers evolving improvements in the breeding and feeding of table poultry. But in attempting—as I am asked to do—to contribute a short chapter on the production of table poultry to this Journal, I would first of all point out how important a matter it is that the questions of egg production and meat should be considered in unison. We have the expert egg farmer and equally the expert table fowl producer, both of whom work on special lines conducive to the best profits, but they are a minute quantity compared to the thousands who keep poultry in a more ordinary sense, either as an offshoot to other branches of business or as a paying hobby. And seeing it is to these latter that we must inevitably look more and more for increased supplies, and the great bulk of poultry produce, it is obvious how necessary it is to study combination in the class of bird which should be cultivated. I am afraid we must admit that in certain breeds and certain cases increased egg records have been made of such singular importance that the quality and possibilities as table fowls has suffered. Just as one instance, let us take the White Leghorn. We were told by the leading experts, and no doubt truly, that it was the little active type that were the heavy layers, and not the larger specimens such as figured in the prize lists at our classic shows, but what is the result when the ordinary poultry keeper has got through his season's breeding and is able to select as many pullets as he requires, he finds himself with a lot of diminutive pre-developed cockerels which can only be disposed of with the utmost difficulty, and most likely at a loss, which saddles the profits of their egg producing sisters. Is it not, therefore, far better for ordinary poultry keepers, and perhaps especially agriculturists, to have something which will do moderately in eggs and at the same time serve up well to table, rather than sprinters and record breakers in the egg line of no table value? We must press every possible source for all the increased food that can possibly be produced, and not for one thing at the expense of another. There is more benefit in a combination fowl than either a record egg sprinter of no table value, or a first-class table fowl that will not give a reasonable egg output.

If the comparatively modern plan of intensive poultry culture is any use—and I hold it has its proper place—it should be in raising table fowls, provided all that are so raised are killed for that purpose, irrespective of sex, because it is obvious and has been conclusively proved that pullets raised intensively should not be bred from. I have myself raised fowls intensively for the table with most satisfactory results, but when the system becomes a craze and is used improperly, it is disastrous. In breeding table fowls suitable first crosses are of the utmost importance, especially when we consider the wisdom of a combination such as above referred to, but, generally speaking, it will be best not to re-cross. From a first cross between two pure breeds you know just what to expect, but if these results are bred from there is great uncertainty, and probable degeneracy and mongrelism. I have noticed this in almost all kinds of stock—more than 30 years ago I knew a farmer on the Cotswolds who had a fine flock of the then generally kept in that district—White-faced Cotswold sheep. He crossed with pure Hampshire rams with the greatest possible success, finer sheep than those half-breeds one never need wish to see, but his re-crosses with Shrops, Oxfords, &c., soon worked mischief, and eventually he cleared right out and bought in fresh Cotswold ewes, and stuck subsequently to the first cross, fattening off all the tegs each year, irrespective of sex, and doing the same by the ewes when they reached a certain age. It is just the same with poultry. Whatever the object of the cross it is easy for anyone to amalgamate two pure breeds, but quite another matter to evolve satisfaction from subsequent matings.

To enumerate all the best pure breeds and best crosses for producing table fowls would be impossible to suit all cases, because there are so many varying conditions such as soil, climate, and the class of table fowl required according to the class of trade or customer for which it is required, but I like best to write of what I know myself either from personal experience or observation, and if I treat chiefly of crosses it will be obvious which pure breeds come pretty much within the same category. Taking the Dorking and the Sussex as two of the leading pure table breeds that at the same time are moderately good layers, we find them so serviceable for first crosses that it is almost impossible to misplace them—making, of course, such matings as would best tend to the class of progeny required. Then we have the Faverolles and the Indian Game. The “Fav” is in itself a French composite breed, founded on the Houdan the Dorking and the Brahma, and I shall, lower down, have something to say about its crosses. The Indian Game is proverbially an indifferent layer of excellent table properties, and here we have an instance of what a first cross will do. Granted in most cases laying is a question of strain rather than breed—but I doubt if anyone ever knew a pure-bred Indian that was a really good layer, and yet I have known several cases where the pullets produced by a first cross with this and some other pure breeds have proved most excellent layers whilst both them and their brothers left nothing to be desired as table fowls. I believe there are often in such

cases great latent possibilities which are developed by crossing, and that is why I see such advantages in a first cross for combination utility purposes. The Indian-Dorking, Indian-Buff Orpington, and Indian-Faverolles are all three well-known matings that produce good results, and in the case of the mating of an Indian cockerel with Buff Orpington hens, one thing I have been particularly struck with in the resultant pullets was the very little desire to incubate—and yet excessive broodiness is so usually the drawback to both pure bred ancestors. Apparently the development of the latent laying powers, as above mentioned, at same time checks inordinate broody tendencies. Reverting to Faverolles reminds me that we must not overlook the Rhode Island Red, which, in itself, is a very useful table bird, and only last season a friend of mine mated a Rosecomb Rhode Island cockerel to some Faverolles hens, and when I saw some of his chickens that had nearly reached killing age I was struck with both size and quality. They had grown very quickly, and had such long, deep keels well covered with meat that I fancy this cross is one to be generally advocated. That you had a good table bird was obvious, and from both parents there should be every reason to expect egg production. In one instance too, I have seen a very nice quality of stock bred from a somewhat unusual cross, viz., a White Orpington cock with Faverolles pullets, and again here we must not forget the pure White Orpington as a table bird. Certainly in its pure state it stands out as a premier over all the other Orpingtons. And as a table fowl the only, or at all events chief advantage or improvement that I can see likely to be gained by crossing it, would be increased hardihood, as at all events some strains of this breed are inclined to a little delicacy of constitution. We have a great deal yet to learn as to how best to arrive at that combined desideratum, the good table fowl and prolific layer. Some of the old recognised orthodox crosses will, no doubt, take a lot of beating, but it is not good enough to stop there and cry enough. The possibilities are many, and probably the surprises more if we will but try experiments. Last year I happened to have half-a-score of spare barred Plymouth Rock hens, so I ran in a Rhode Island male, and some quick-growing chickens of nice quality resulted, the singular feature being that every one of both sexes was entirely of barred Rock colour—quite contrary to the old and often correct theory of the externals coming from the male, not one of some 80 I bred showed a trace of the cock's colouring. On the other hand, this season I have placed with some of the self-same hens a white Leghorn cockerel, and every chicken is as white as their male parent, not a barred feather to be seen on any one of them! It sets one wondering why the male of one breed was so much more impressive than the other, and how far such impressions are possible in other points of more importance, such as table properties or eggs. To a very great extent we must each learn these things for ourselves, because, as I have already said, what suits one's conditions and requirements, may not be the best for another—e.g., in some cases a large table fowl is a desideratum, and in others a more compact and quicker-growing type such as

the half-bred Leghorn may be preferable—but for a generally all-round useful cross likely to suit the majority of cases, producing a hardy, quick-growing, good class of table fowl, suited to most places, but perhaps specially to the free range of the farmer and of which the pullets can be kept as dependable layers, I feel for the present inclined to “Go nap” on a *Rosecomb* Rhode Island red male mated to White Leghorn females of the Australian laying strains. For the past three years my son has bred quite a number of these, and finds them most suitable on his ordinary farm, selling the cockerels for table, keeping pullets for layers, and also for sending broods of week-old chickens to almost all parts of the country, and not only have they given satisfaction at home, but many who have had broods have reported subsequently how well they turned out. Here again we come across another interesting item in breeding. No matter which sex, every bird produced from this cross inherited the rosecomb of the male parent. I don’t think we have had a single instance of a reproduction of the Leghorn’s single comb. In this case you see the male’s external prevails, and it is well, because the laying pullets will be the better winter layers. I strongly favour the rose in preference to the single comb in Rhode Islanders pure-bred because I have proved them in consequence to be less affected by adverse climatic influences. The professional fatter knows what breeds and what crosses are best suited to his purpose. He is, or should be, master of his business, and it is not for such as he that I am trying in these rambling notes to assist in encouraging improved table poultry breeding and rearing. What we want is increased production and improved quality on the farms and with the private breeder. It is to the land that we must look chiefly and especially for breeding, as the fatter buys to fatten and rarely breeds. The opportunities of the farms are practically still undeveloped, but we must not encourage or advise specialising in one branch, but rather the production of an improved all-round type; and he it remembered the farmer has many other duties on his daily rounds, he wants a breed that will turn out a well-developed table fowl fit to kill direct off the farm after judicious feeding and not one requiring to be placed in the fattening pen. And this has its bearing on the breed or cross selected.

Improved methods of poultry culture are greatly hampered by the craze of carrying to extremes what in reason would be useful improvements. Just at the moment it is “dry mash” that is being exploited to madness and exclusion of reason. Looking back a couple of decades we see one thing after another similarly rushed to the front as the one and only royal road to success, and in a number of cases much harm has been done through these crazes by misleading the novice and beginner, who subsequently retires in disgust. “Man cannot live by bread alone.” Neither would he like to be always confined to one meat, one pudding, or one vegetable, he thrives on an approved and suitable variety, and so, too, does the chicken and the adult fowl, be its prospect eggs or meat. The introduction of dry chicken feed was a first-rate innovation, but cranks at once seized on it and ran it to extremes. Doubtless they were honest in their

convictions in many cases, but, nevertheless, doing harm by advocating extremes. We must, too, I am afraid, admit that in some cases some things have been boomed in order to make profit, either directly or indirectly, out of trade production of the articles in question. Were I to publish a list of the offers that have been made to me as a journalist to puff certain articles of nearly every class of goods used by poultry keepers, or recommended by their traders to be used, methinks it might astonish some readers. But I refrain to do more than say I have always absolutely refused such offers, as I wished to be free to discuss every phase of poultry culture honestly as it came along.

On the very day I write these notes I think I have bottomed a case which has given a well-known old fancier friend of mine some trouble. Like most fanciers he has been turning his attention to utility breeding during the war, and has taken up table poultry, especially by breeding Sussex. Some trouble came along a week ago with a lot of half and three-quarter grown youngsters, crop binding, &c., with a number of deaths. I have not been able to visit the yard, but our correspondence has, I think, satisfactorily led to the discovery that the trouble has arisen through the use of one of the ingredients in the soft food, and those who have to purchase their meals cannot be too careful in procuring articles of the best and purest quality. Here the farmer of arable land has an advantage, inasmuch as he can usually grind, or have ground locally, cereals of his own production.

A great deal to do with the successful and profitable production of a table chicken lies in the wholesome foundation that is laid during its growth, and this is best ensured by the use of sound grains and meals of the best possible quality. A very successful exhibitor of table fowls has recently told us that milk and oats are the chief foundations of his success in producing at one time both quality and quantity of flesh in the shortest possible time. Farmers do not all want to become exhibitors, but they have mostly the opportunity to make good use of this man's experience in some form or other, and with their unrivalled all-round opportunities let them be warned against buying all sorts of things recommended by cranks, and they can at less expense than any other class of people more greatly increase the poultry food supply of the nation. To those who have to buy such foods the same advice applies, do not let them be frightened by prices, there is every possible indication that the value of well-fed chickens will be commensurate with the advanced food prices.

To a considerable extent there is still room to educate the existing and prospective consumer. The crammed and artificially fattened fowl is all-right so far as it goes, but there is no denying the fact that such birds render a much greater complement to the dripping pan than does a well-fed young cockerel direct off the farmyard run. Moreover, there is further no question as to the flavour of the two kinds. No doubt there is room for both, and I have no wish to unduly decry the table fowl fed by the professional fatter on various kinds of fat and other substances, most of which the bird probably would not touch in

freedom, but what I wish to do is to encourage the British Agriculturist to daily pay more and more attention to the production of the best class of poultry meat just as he does mutton or beef, and to impress on the buyer, and especially the private householder, that the best value can be obtained by purchasing the naturally fed bird direct off the land. How things will shape after this great upheaval no one can positively say, but it is almost certain we shall see much more *petite* culture both on the large and small holdings with a great increase of the latter. And one of the foremost points in the small holders' programme must be direct trading as much as possible and in nothing more than eggs and table fowls. Probably co-operation may advance but personally I have more faith in each person working up his own business direct with the purchaser. The expenses attached to co-operative deposits and system seem in most cases to severely handicap its advantages. Although, as above noted, prices of table fowls have risen to a certain extent with the increased prices of foods, they are yet moderate compared with other things, and I maintain that to-day an egg and a table fowl are two of the cheapest foods on the market. Extraordinarily high prices are not advantageous to the producer because they place the article beyond the reach of a large number of buyers who then turn to some other article instead of the fowl they would otherwise purchase, hence it is of the utmost importance that in breeding and feeding—in fact in the entire course of production—any economy that can be advantageously practised, so that increased rather than diminished demands should be experienced, should be considered of more value than increased prices.

An important point in cost of production and consequent profit is the rapidity with which the table chicken can be marketed. And this is, I often notice, a rock on which many producers and perhaps particularly farmers, split. The birds are too long on the ground. It may be that a sufficiently quick-growing variety or cross has not been chosen, but it may also, and more likely, be that they are not pushed on as quickly as they might be, or it may be both. But, anyhow, it is obvious that if three lots can be worked off in the space previously occupied by two that it must be an advantage. That is one reason why, above, I have put the Faverolles in a prominent position—pure-bred, it is a quick grower. That is its chief point of vantage to the grower for the French market, and the object that chiefly led to its original production in that country, and it lends itself to suitable crosses for the same reason. The Sussex is an admirable table fowl and highly valued by many of the best and most successful producers for that purpose, but one must admit that the chickens of these breeds generally are not the fastest growers possible to find. I think one of the chief reasons why Mr. Ade and some other Sussex breeders introduced the Brown Sussex as a fourth distinct variety was because it was more quick to develop and mature than its predecessors. An important point in producing table fowls is uniformity. I mean that the birds that are to be killed should be as much as possible of even calibre, so that the buyer who was pleased with one would know what he was

getting when he came again, that is why pure breeds or first crosses are preferable to mongrels varying in type and consequently irregular in production. One of the weakest features in the production of table poultry on the farm is often found in the reluctance to, or carelessness in, not finishing the birds properly. Up to a certain point they are done well, but care slackens as they reach maturity and, particularly the cockerels, they are allowed to become "razor" breasted and are sent to market with frames not well furnished. Not long ago a local poulterer who buys largely told me that as a rule 75 per cent. of the fowls sent in to him from the farms were as above described. That he often had to put birds of this class in fattening pens to finish before being fit to kill in a form that would satisfy his customers, and, of course, it stands to reason that by marketing in such a condition the best and most profitable prices are not obtained. One of the chief causes of this state of affairs lies in what I have referred to above, viz., keeping the birds too long on the ground. The best quality and most profitable table fowl is the one that is most quickly matured and well finished off in the least possible time. Above, I made some reference to the intensive methods of poultry culture that are now so popular and deservedly so, for those whose space is limited; but in the vast majority of cases intensivism means egg production. And just now when we are all advocating every possible method of increasing home supplies it seems to me that many of those who have only backyard or suburban facilities might very well pay more attention to fattening for the table. It takes very little space to accommodate fattening pens for 10 or 20 birds, many of the professional fatters are practically cottagers and roadside poultry keepers. Why should not the amateur succeed equally as a fatter as an egg-producer on an equally small scale—buy in his birds of an age ready for the fattening pen, and fat them off just as well and profitably in his small space as does the Sussex and Surrey man in hutches by the roadside or in the cottage garden? There seems to me to be room for a great deal more to be done in this direction.

Do I advocate the artificial hatching and rearing of fowls destined for the table? Well, of course, incubators and foster-mothers are a necessity where large numbers are produced, especially early in the season, when broody hens are scarce. The greatest danger probably lies in the liability to variations of temperature in both machines, which has a tendency to produce eventually deranged livers, which may not be noticeable at the time, but which eventually causes trouble by the difficulty to fatten delicate subjects properly, and probably some deaths—and such birds may, in the case of pullets particularly, bring the breeder much trouble if any of them are kept for breeding stock, as they are most likely to produce delicate offspring. On the whole I think it is safe to say that the strongest birds and those most profitable to fatten off for market are those produced by natural rather than artificial methods.

Turkey culture is undoubtedly likely to be much more generally practised than it has been in the past, but it is a branch of the industry dependent greatly upon individual circumstances and seasons. On

some farms I know it is a most profitable side line, and on others a failure though possibly the owner is equally practical and energetic. The turkey is not indigenous here, and it seems to thrive as favourably in some places as it fails equally in others, but there is one other branch of table poultry culture that deserves more general attention than it gets on the farms in many parts of this country, and that is the raising and fattening of geese. It is very unfortunate that the fashion of eating goose at Michaelmas has fallen so much into abeyance, because the Michaelmas goose goes to market plump and well-flavoured direct from the grass field or the stubbles, and though of less weight it pays the producer better than when it has to be kept till Christmas, and consequently corn fattened, but in either case the goose can be made to show a good margin of profit. It is suited to practically all localities, is hardy, easy to rear, costs little to feed, and improves the pasture on which it feeds.

Finally, to the amateur poultry feeder I would say, do not be afraid that you will lose because you are not a professional dresser, you may very possibly sell the bulk of your stock alive, but if you can work up a retail trade for killed and dressed poultry, it should be nursed and encouraged as being more profitable and worth the extra trouble by securing the middleman's profits for yourself, if you are in a position to do the dressing or get it done reasonably. At the present time I am getting mine done by a woman at per head in her own cottage—it economises the existing scarce labour for me, and she is not only doing her bit towards home production, but also benefiting herself. Private buyers know an amateur dressed bird, and usually learn to prefer it to one from the professional, which is, by his arts, made to look better than it really is.

Those who have to buy all their foodstuffs find prices high now, but the prices of table fowls are gradually levelling up to them. Other meats and foods for human consumption are dear, and the medium-priced table fowl is daily becoming a more general article of consumption by the middle classes.

My advice to poultry keepers generally, and particularly to agriculturists, is to keep a sharp eye on table poultry culture, not as a speciality at the cost of egg production any more than vice versa, but to endeavour to so breed your stock that along with a fair egg output you have a good class of table bird, for which there is sure to be an increasing demand, for which the farms have such vast undeveloped resources and opportunities. Carried out on anything like practical lines there is money in it.

ANNUAL REPORT OF THE CONSULTING CHEMIST.

By F. J. LLOYD, F.I.C., F.C.S.

IN the first place, allow me to draw the attention of members who may not have been already notified of the fact that my address is now 135, Queen's Road, Finsbury Park, N. 4. This address is easily reached by members who may wish to consult me, there being a Tube from Moorgate Street for those who come from the East, and another from Hammersmith, *via* Russell Square and King's Cross, for those who come from the West. As regards samples sent by post, these reach me as quickly as they did in the City, hence there is no delay in reporting the results of my analyses. Finsbury Park is also within easy distance of the Agricultural Hall, and will facilitate the work entailed by the Dairy Show, when this is again held, as we must hope it soon may be.

The number of samples submitted to me for analysis during the past year was 126, an improvement on the year 1915, when only 91 samples were sent. Nevertheless, that from a society of dairy farmers numbering about 1,000 members, so small a number of samples should be deemed worthy of analysis is astounding. The consulting chemist to a society is appointed to help the members to carry on their business to the greatest possible advantage. His duty is to supply them with facts, for "knowledge is power" more, perhaps, to-day than it ever was. Why is it that farmers do not utilise the advantages of scientific knowledge? The report of the consulting chemist to the Royal Agricultural Society—which has ten times as many members as the Association—reveals the same indifference. These facts deserve serious attention. While keenly anxious that the farmers of this country should be second to none in the world, one cannot forget that the law of the survival of the fittest will inevitably prevail in agriculture as in all else; and the fittest in every industry are those who are guided by facts rather than fancies.

The majority of the samples submitted to me were milk, many being sour and sent only because there had been some complaint. There is no need to comment on the fluctuations in the composition of milk. Every producer ought by this time to know the conditions which tend to produce poor milk, and how to guard against them. Adulterated samples are rare, but do at times reach me. According to my experience, however, many prosecutions for adulteration are instituted simply because the milk falls below the limits, without any further evidence of adulteration. The loss of time and money, and the anxiety which these prosecutions entail are a serious hindrance to the development of the dairy industry, and the sooner steps can be taken to put this matter on a sounder footing the better it will be for both the producers and consumers of milk.

A number of samples of cream and cream cheese have been sent for the estimation of boric acid. The prosecutions against producers, because these articles contain more boric acid than some local authorities think desirable, are a disgrace to the country. If the Government departments concerned in the administration of Food Laws find it difficult—with all the expert advice and work they are able to obtain—to decide what proportion of a preservative is or is not injurious to health, what right have they to leave such decision to local authorities who have neither the knowledge nor the advice which can enable them to come to a judicious decision? These prosecutions tend to destroy a home industry of some importance, there is no evidence to prove that any of the public are benefited, while many are seriously inconvenienced.

At a time when manures and feeding stuffs are exceptionally dear, and every precaution necessary in their purchase and use, it is remarkable that only one sample of manure was sent me, and only four feeding stuffs. Some of the latter call for attention. In one case the member was advised not to use the material, and, fortunately, did not, for subsequently it came to my knowledge that similar material had done much harm.

A meal which should have been barley was found to contain much oat husk, a substance which appears to be specially prepared for mixing with feeding meals, needless to say not to their improvement.

The most serious case was a cake found to be grossly contaminated with castor seed. This cake was poisonous and had very serious effects upon the member's herd.

When the cake was first given and in small quantities, he noticed several heifers and the older cows beginning to look like "wasters." Later on the cows were lying about ill, very weak, and with little or no milk, although they had been out in fresh grass. A bag of cake was now opened the contents of which happened to be badly adulterated. The cows became seriously ill, scouring fearfully, they were soon unable to rise, and if helped up could not stand.

This description of the effects of castor is so typical that it seems worth while to record it, that others may be enabled at the very first symptoms to suspect some poisonous material in the food and to take precautions.

There have been several samples of water, and of other materials which call for no special notice. I have been consulted on several occasions with, I trust, benefit to those who sought information, for it is my constant desire to help individual members and the Association so far as lies in my power.

British Dairy Farmers' Association.

EXAMINATION FOR THE B. D. F. A. DIPLOMA.

The Association grants to any Candidate who satisfactorily passes the necessary Examinations:—

A Diploma and Silver Medal for Proficiency in the Science and Practice of Dairying and Dairy Farming.

Candidates for the Diploma must have previously obtained the Butter and Cheese-making Certificates of the Association,* and must produce satisfactory evidence that they have received not less than one year's scientific and practical instruction at some recognised centre for Dairying Instruction, and have spent at least twelve months on a farm in addition to the time spent at the Centre.

The Examination will extend over three or more days, and will test (1) the knowledge and experience of the Principles and Practice of Dairying and Dairy Farming, and (2) the skill in making Butter and Cheese, of each Candidate.

Candidates will be required to answer, in writing, sets of questions within a given time, and will also be examined *viva voce*. They will be expected to possess a detailed and precise knowledge of all the subjects included in the following Syllabus. They will have to make both Butter and Cheese. Candidates, if required, must produce their note-books of Lectures and Demonstrations attended.

Examinations for Diploma are held in the Autumn upon dates announced in the *Agricultural and Dairy Press*.

Entries will close 28 days prior to the date fixed for the Examination.

The Entry Fee is 10s.

SYLLABUS.

1. DAIRYING.

- (a) **Milk.**—The Yield of Milk from various Breeds; Milking; Handling of Milk from Cow to Dairy; Importance of Cleanliness; Cooling of Milk; Sale of Milk; Influence of Food on the Yield, Flavour, and Fat Contents of Milk; Composition of Milk, Nature and Properties of its Constituents; Differences between Morning and Evening Milk and their Causes; Methods of Sampling and Simple Methods of Testing Milk, as the Lactometer, Creamometer and Centrifugal Fat Testers; Testing for Acidity; Causes of Fermentation; Colostrum, its Nature and Properties; the Keeping of Dairy Records; the Handling of Evening's Milk for Cheese-making; Properties of Milk suitable for Cheese-making; Taints in Milk—their Causes, Effects and Remedies; Tests for such Taints; the Ripening of Milk for Cheese-making; Methods and Reasons for Ripening; use of Natural and "Culture" Starters; Pasteurization of Milk; Chilled Milk: their Subsequent Use for Cheese-making; Special Testing of Milk, Whey, and Curd requisite in a Cheese Dairy.
- (b) **Cream.**—The Various Methods of obtaining Cream; the Construction and Use of the Utensils Employed; Separators, the Construction and Use of the various Types; Composition of Cream, Separated Milk, Skimmed Milk and Butter-milk, with Simple Tests for Fat in same; the Ripening of Cream, Objects and Results; Changes during Ripening; Testing for Acidity; Natural and Artificial Ripening and Preparation of Starters; the Preparation of Cream for Churning; Preparation of Cream for Sale; Clotted Cream.

*Equivalent Certificates of recognised bodies will be accepted by the Association as evidence of sufficient training to justify entry for this Examination.

- (c) **Butter.**—The Various Methods of obtaining Butter, including the Churning of Whole Milk; Utensils required and the Preparation, Use and Care of same; the Process of Butter Manufacture in all its Details; Conditions which affect the Butter Yield; Circumstances affecting the Flavour, Texture, Colour and Keeping Properties of Butter; Dry-salting and Curing of Butter; Faults in Butter and their Causes; Composition and Properties of Good Butter; Composition and Causes of Inferior Butter; Methods of Judging Butter.
- (d) **Cheese.**—Rennet: its Preparation, Properties, and Action upon Milk; Testing its Strength; Storage of Rennet; Substitutes for Rennet; Annatto; the Colouring; Discoloration of Cheese; a General Knowledge of the Manufacture of the Principal Varieties of Hard-pressed, Blue-veined, and Soft Cheeses including the use of Wood and Metal Tubs and Jacketed Vats; Methods of Scalding; the Development and Control of Acidity in Curd; Salting and Brining in Cheese-making; Bandaging; Ripening and Storing of Hard-pressed, Blue-veined and Soft Cheeses; Defects in Cheese and their Causes; Composition of Cheese; Composition and Utilization of Whey; the Manufacture of Whey Butter; the Equipment of a Cheese Dairy and its Cost; the Care of Utensils.

Candidates will be required to make one Hard-pressed Cheese, either Cheddar, Cheshire, or Derby, to be selected by the Examiner, and one Blue-veined Cheese, either Stilton or Wensleydale, to be selected by the Candidate. They must also have a knowledge of the manufacture of other varieties of Hard-pressed Cheese, and of Soft Cheese.

2 DAIRY FARMING.

(a) The General Principles and Practice of Dairy Farming; the Management and Equipment of a Dairy Farm.

(b) **Agricultural Botany.**—Appearance and Identification of the Common Varieties of Grasses and other Pasture Plants and Weeds. Their Effects upon Milk and Dairy Produce.

(c) **Crops.**—A General Knowledge of the Cultivation, Manuring, and Harvesting of Farm Crops with a Special Knowledge of those Crops employed in the Feeding of Dairy Stock; the Management of Pasture and Meadow Land; Haymaking and Ensilage: the Factors which bear on their value as Fodder for Stock.

(d) **Foods and Feeding.**—The Effect of various Foods on Milk and its Products; Systems of Feeding and the Compilation of Rations.

(e) **Live Stock.**—Characteristics and Management of Different Breeds of Cattle; their Breeding and Rearing; Choice of Dairy Cattle for Special Purposes and Situations; Pigs and Poultry; Suitable Breeds for Use in Connection with a Dairy Farm and their Management; Horses.

(f) **Diseases of Dairy Stock**, such as: Tuberculosis, Anthrax, Foot and Mouth Disease, Contagious and Sporadic Abortion, Chronic and Acute Indigestion, Mastitis, Milk Fever, Sore Teats, Husk, Diarrhoea, White Scour in Calves, Common Causes of Poisoning.

(g) **Physiology of Digestion and Milk Secretion.**

(h) **Buildings suitable for a Dairy Farm:** their Situation, Construction, Ventilation, Drainage, &c.; Water Supply.

(i) **Book-keeping on a Dairy Farm; Milk Records; Business Methods involved in Dairying and Dairy Farming.**

(k) **Farm Implements and Machines;** their construction and use.

3. AGRICULTURAL CHEMISTRY.

(a) General.—The Chemical Elements and Constituents found in Milk, Soils, Plants, Manures, Animals and Foods: their Nature and Properties so far as they relate to Agriculture; the simpler Laws of Chemical Combination and Change so far as regards these Substances.

(b) Dairy.—The Composition and Properties of Milk, Cream, Butter, Cheese, and Dairy Products, and of all Substances used in the Dairy; Simple Methods of Analysis as applied to these Substances; the Chemical Changes which may take place in Milk, Cream, Butter, &c.

(c) Agricultural.—The Composition and the Chief Chemical and Physical Properties of Soils, and their Constituents; the Chemical Means of Ameliorating the Soil; the Source, Composition, and Use of the usual Natural and Artificial Manures; the Chemistry of Plant Growth; the Composition of Crops; the Source, Composition, and Use of Artificial Feeding Stuffs; Drinking Waters; the Chemistry of Animal Nutrition.

4. AGRICULTURAL BACTERIOLOGY.

(a) General.—Bacteria, their Form, Classification, Growth and Reproduction; The Microscope and its Use; Staining and Microscopic Examination of Bacteria; Methods of Isolation and Cultivation; Preparation of Culture Media; Fermentations and Chemical Changes produced by Bacteria; Enzymes and their Action; Effects of Heat, Cold, Sterilization, Pasteurization, Disinfectants, and Preservatives on Bacteria and Enzymes.

(b) Dairy Bacteriology.—The Bacteria of Milk and Dairy Products; Examination of Milk for Foreign Bodies, Sediment, Blood, Pus, and Pathogenic Organisms; the Bacteriology of Milk, Cream, Butter, and Cheese; Commercial Bacterial Preparations for use in the Dairy; Bacteria Injurious to Dairy Produce: their Source, Nature, and Treatment.

(c) Agricultural Bacteriology.—The Bacteria of the Soil; Bacteriological Examination of Soils, Air, Water, &c.; Action of Heat and Antiseptics on Soil Bacteria; Nitrification; Bacteriology of Farmyard and other Manures; Plant Bacteria and Assimilation of Nitrogen.

(d) Fungi (Moulds) and Yeasts.—Their Forms, Classification, and Growth; their Relation to Dairy Produce, to Soils and Plants, and to Feeding Stuffs.

Particulars and Entry Forms may be obtained from

The SECRETARY,

BRITISH DAIRY FARMERS' ASSOCIATION,

28, Russell Square, London, W.C. 1.

EXAMINATION FOR DAIRY TEACHER'S CERTIFICATE.

The Association grants to any Candidate who satisfactorily passes the necessary Examinations :—

A Teacher's Certificate for Proficiency in the Science and Practice of Dairying.

Candidates for this Certificate must have previously obtained the Butter and Cheese-making Certificates of the Association,* and must produce satisfactory evidence that they have received not less than twelve months' instruction at a recognised centre for dairy instruction.

The Examination will extend over three or more days, and will test (1) The Theoretical Knowledge of the Candidates; (2) their skill in making Butter and Cheese; and (3) their ability to teach and elucidate the Elementary Principles and Practice of Dairying.

Candidates will be required to answer, in writing, sets of questions within a given time, and will also be examined *viva voce*. They will be expected to possess a detailed and precise knowledge of the subjects included in the following Syllabus, together with a fair knowledge of the General Management and Feeding of Dairy Cattle. They must produce a Certificate of their ability to milk. Candidates, if required, must produce their note-books of Lectures and Demonstrations attended.

Examinations for Teacher's Certificates are held in the Autumn, upon dates announced in the Agricultural and Dairy Press.

Entries will close 28 days prior to the date fixed for the Examination.

The Entry Fee is 10s.

SYLLABUS.

1. Milk.—The Yield of Milk from various breeds; Milking; Handling of Milk from cow to dairy; Importance of Cleanliness; Cooling of milk; Sale of Milk; Influence of Foods on the Yield, Flavour, and Fat Contents of Milk; Composition of Milk, Nature and Properties of its Constituents; Differences between Morning and Evening Milk and their causes; Methods of Sampling, and Simple Methods of Testing Milk, as the Lactometer, Creamometer, and Centrifugal Fat Testers; Testing for Acidity; Causes of Fermentation; Colostrum, its Nature and Properties; the Keeping of Dairy Records; the Handling of Evening's Milk for Cheese-making; Properties of Milk suitable for Cheese-making; Taints in Milk, their Causes, Effects and Remedies; Tests for such Taints; the Ripening of Milk for Cheese-making; Methods and Reasons for Ripening; Use of Natural and "Culture" Starters; Pasteurization of Milk; Chilled Milk: their subsequent Use for Cheese-making; Special Testing of Milk, Whey, and Curd requisite in a Cheese Dairy.
2. Cream.—The Various Methods of Obtaining Cream; the Construction and Use of the Utensils employed; Separators, the Construction and Use of the various Types; Composition of Cream, Separated Milk, Skimmed Milk, and Butter-milk, with Simple Tests for Fat in same; the Ripening of Cream: Objects and Results; Changes during Ripening, Testing for Acidity; Natural and Artificial Ripening and Preparation of Starters; the Preparation of Cream for Churning; Preparation of Cream for Sale; Clotted Cream.
3. Butter.—The Various Methods of obtaining Butter, including the Churning of Whole Milk; Utensils required and the Preparation, Use and Care of

*Equivalent Certificates of recognised bodies will be accepted by the Association as evidence of sufficient training to justify entry for this Examination.

same; the Process of Butter Manufacture in all its details; Conditions which affect the Butter Yield; Circumstances affecting the Flavour, Texture, Colour and Keeping Properties of Butter; Dry-salting and Curing of Butter; Faults in Butter and their causes; Composition and Properties of Good Butter; Composition and Causes of Inferior Butter; Methods of Judging Butter.

4. Cheese.—Rennet: its Preparation, Properties, and Action upon Milk: Testing its Strength; Storage of and Substitutes for Rennet; Annatto; the Colouring of Cheese; Discoloration; a General Knowledge of the Manufacture of the Principal Varieties of Hard-pressed, Blue-veined, and Soft Cheeses, including the use of Wood and Metal Tubs and Jacketed Vats; Methods of Scalding; the Development and Control of Acidity in Curd; Salting and Brining in Cheese-making; Bandaging; Ripening and Storing of Hard-pressed, Blue-veined, and Soft Cheeses; Defects in Cheese and their Causes; Composition of Cheese; Composition and Utilization of Whey; the Manufacture of Whey Butter; the Equipment of a Cheese Dairy, and its Cost; the Care of Utensils.

Candidates will be required to make one Hard-pressed Cheese, either Cheddar, Cheshire, or Derby, to be selected by the Examiner, and one Blue-veined Cheese, either Stilton or Wensleydale, to be selected by the Candidate. They must also have a knowledge of the manufacture of other varieties of Hard-pressed Cheese, and of Soft Cheese.

5. Dairy Farming.—Its General Principles, Practice, and Management.
6. Food and Feeding Stuffs.—Suitable and Unsuitable Foods; Suitable Rations; Preparation of Food for Dairy Stock.
7. General Book-keeping of a Dairy.
8. The Method of Organising an Itinerant Dairy Class.
9. DAIRY CHEMISTRY.—The Chemical Elements and Constituents found in Milk, Animals and Foods; their Nature and Properties so far as they relate to Dairying; the Composition, and the Properties of the Constituents of Milk, Cream, Butter, Cheese, and Dairy Products, and of all Substances used in the Dairy; Simple Methods of Analysis as applied to these Substances; the Chemical Changes which may take place in Milk, Cream, Butter, &c.
10. DAIRY BACTERIOLOGY.

(a) Bacteria, their Form, Classification, Growth and Reproduction; The Microscope and its Use; Staining and Microscopic Examination of Bacteria; Methods of Isolation and Cultivation; Preparation of Culture Media; Fermentations and Chemical Changes produced by Bacteria; Enzymes and their Action; Effects of Heat, Cold, Sterilization, Pasteurization, Disinfectants, and Preservatives on Bacteria and Enzymes.

(b) The Bacteria of Milk and Dairy Products; Examination of Milk for Foreign Bodies, Sediment, Blood, Pus, &c.; the Bacteriology of Milk, Cream, Butter and Cheese; Commercial Bacterial Preparations for Dairy use; Bacteria Injurious to Dairy Produce—their Source, Nature, and Treatment.

(c) Fungi (Moulds) and Yeasts.—Their Forms, Classification, and Growth; their Relation to Dairy Produce.

Particulars and Entry Forms may be obtained from

The SECRETARY,

BRITISH DAIRY FARMERS' ASSOCIATION,

28, Russell Square, London, W.C. 1.

EXAMINATION FOR CHEESEMAKING CERTIFICATE.

The Association grants to any Candidate who satisfactorily passes the necessary Examination—

A Certificate of Merit for Proficiency in the Theory and Practice of Cheesemaking.

The Examination, which will extend over two or more days, will test the Theoretical Knowledge of the Candidates and their Practical Skill in Cheesemaking. Each Competitor will be required to answer, in writing, a set of questions within a given time, and will also be examined *viva voce*. On the same or following day a Practical Examination in Cheesemaking will take place.

Candidates for this Certificate must, at the time of entry, produce satisfactory evidence that they have received at least twelve months' instruction in the Theory and Practice of Cheesemaking, of which at least six months must have been spent at a recognised centre for dairy instruction. They must possess a fair knowledge of the subjects included in the following Syllabus.

Candidates will be required to make one Hard-pressed Cheese, either Cheddar, Cheshire or Derby, to be selected by the Examiner, and one Blue-veined Cheese, either Stilton or Wensleydale, to be selected by the Candidate. They must also have a knowledge of the manufacture of other varieties of Hard-pressed Cheese and of Soft Cheese.

Candidates are at liberty to bring their own utensils for the Practical Examination if they wish to do so.

Examinations for Cheesemaking Certificates are held twice a year, viz., in the Spring and Autumn, upon dates announced in the Agricultural and Dairy Press.

Entries will close 28 days prior to the date fixed for the Examination.

The Entry Fee is 5s.

SYLLABUS.

1. Milk.—The Yield of Milk from various breeds; Milking; Handling of Milk from Cow to Dairy; Importance of Cleanliness; Cooling of Milk. Influence of Food on the Yield, Flavour and Fat Contents of Milk, Composition of Milk, Nature and Properties of its Constituents; Differences between Morning and Evening Milk and their Causes; Methods of Sampling and Simple Methods of Testing Milk, as the Lactometer, Creamometer, Centrifugal Fat Testers; Testing for Acidity; Causes of Fermentation; Colostrum, its nature and properties; the Keeping of Dairy Records; the Handling of Evening's Milk for Cheesemaking; Properties of Milk suitable for Cheesemaking; Taints in Milk, their Causes, Effects and Remedies; Tests for such Taints; the Ripening of Milk for Cheesemaking; Methods and Reasons for Ripening; use of Natural and "Culture" Starters; Pasteurization of Milk; Chilled Milk; their Subsequent use for Cheesemaking; Special Testing of Milk, Whey, and Curd requisite in a Cheese Dairy.

2. Cheese.—Rennet: its Preparation, Properties, and Action upon Milk; Testing its Strength; Storage of and Substitutes for Rennet; Annatto; the Colouring of Cheese; Discoloration; a General Knowledge of the Manufacture of the Principal Varieties of Hard-pressed, Blue-veined, and Soft Cheeses, including the use of wood and metal tubs and jacketed vats; Methods of Scalding; the Development and Control of Acidity in Curd; Salting and Brining in Cheese-making; Bandaging; Ripening and Storing of Hard-pressed, Blue-veined and Soft Cheeses; Defects in Cheese and their causes; Composition of Cheese; Composition and Utilization of Whey; the Manufacture of Whey Butter; the Equipment of a Cheese Dairy and its Cost; the care of Utensils; the Detailed Principles and Practice requisite for the Manufacture of one of the following types of Cheese—to be selected and made by the Candidate:—

(a) A Hard-pressed British Cheese (not less than 25 lbs. weight).

(b) A Blue-veined British Cheese (not less than 10 lbs. weight).

Particulars and Entry Forms may be obtained from

The SECRETARY,

BRITISH DAIRY FARMERS' ASSOCIATION,

28, Russell Square, London, W.C. 1.

EXAMINATION FOR BUTTERMÁKING CERTIFICATE.

The Association grants to any Candidate who satisfactorily passes the necessary Examination—

A Certificate of Merit for Proficiency in the Theory and Practice of Butter-making.

The Examination, which will extend over two or more days, will test the Theoretical Knowledge of the Candidates and their Practical Skill in Buttermaking. Each Competitor will be required to answer, in writing, a set of questions within a given time, and will also be examined *visu voce*. On the same or following day a Practical Examination in Buttermaking will take place.

Candidates for this Certificate must, at the time of entry, produce satisfactory evidence that they have received at least three months' instruction (not necessarily at a Dairy School) in the Theory and Practice of Buttermaking. They must possess a fair knowledge of the subjects included in the following Syllabus. They will be required to make Butter.

Candidates are at liberty to bring their own utensils for the Practical Examination if they wish to do so.

Examinations for Buttermaking Certificates are held twice a year, viz., in the Spring and Autumn, upon dates announced in the Agricultural and Dairy Press.

Entries will close 28 days prior to the date fixed for the Examination.

The Entry Fee is 5s.

SYLLABUS.

1. Milk.—The Yield of Milk from various breeds; Milking; Handling of Milk from cow to dairy; Importance of Cleanliness; Cooling of Milk; Sale of Milk; Influence of Foods on the Yield, Flavour and Fat Contents of Milk; Composition of Milk, Nature and Properties of its constituents; Differences between Morning and Evening Milk and their causes; Methods of Sampling and Simple Methods of Testing Milk, as the Lactometer, Creamometer, and Centrifugal Fat Testers; Testing for Acidity; Causes of Fermentation; Colostrum, its nature and properties; the Keeping of Dairy Records.
2. Cream.—The Various Methods of Obtaining Cream; the Construction and Use of the Utensils employed; Separators, the Construction and Use of any one Type; Composition of Cream, Separated Milk, Skimmed Milk, and Butter-milk, with Simple Tests for Fat in same; the Ripening of Cream—Objects and Results; Changes during Ripening; Testing for Acidity; Natural and Artificial Ripening and Preparation of Starters; the Preparation of Cream for Churning; Preparation of Cream for Sale; Clotted Cream.
3. Butter.—The Various Methods of Obtaining Butter, including the Churning of Whole Milk; Utensils required, and the Preparation, Use, and Care of same; the Process of Butter Manufacture in all its details; Conditions which affect the Butter Yield; Circumstances affecting the Flavour, Texture, Colour, and Keeping Properties of Butter; Dry-salting and Curing of Butter; Faults in Butter and their causes; Composition and Properties of Good Butter; Composition and Causes of Inferior Butter; Methods of Judging Butter.

Particulars and Entry Forms may be obtained from

THE SECRETARY,

BRITISH DAIRY FARMERS' ASSOCIATION,

28, Russell Square, London, W.C. 1.

EXAMINATION FOR FACTORY MANAGER'S CERTIFICATE.

Regulations and Syllabus, viz. :—

Candidates must hold the British Dairy Farmers' Diploma, or Teachers' Certificate, or the National Dairy Diploma.

They must have subsequently spent at least six summer months as Assistant in a Factory dealing with not less than 500 gallons of milk daily.

Candidates will write answers to a paper and be examined orally and practically on the following :—

1. Factory : the Site, Construction and Requirements of a Factory.
2. Lighting and Power in the Factory.
3. Boilers, Engines, Shafting, Fittings, and Apparatus, their disposition and control.
4. Maintenance and Cleansing of Factory and disposal of Waste.
5. Organisation of Labour and use of Labour-saving Devices.
6. Milk, management of, on arriving at Factory : Weighing, Sampling Testing, Recording, Cleaning, &c.
7. Methods of dealing with the Milk for (a) Sale ; (b) Cream Production ; (c) Buttermaking ; (d) Cheesemaking ; (e) Condensing.
8. Refrigerating Machinery and its use.
9. Cold Stores and their Management.
10. Pasteurising and Sterilising Machinery and its use.
11. Cream, preparation of, for Market.
12. Butter : Manufacture and Treatment.
13. Cheese : Manufacture and Treatment.
14. Utilisation of Bye-products.
15. Pig-keeping.
16. Business Management ; Book-keeping ; Stocktaking and Depreciation ; Contracts ; Railway Rates and Conditions ; Statements ; Notices, &c.
17. Law, so far as it affects the Factory, the Management, and the Produce, including main provisions of Factory and Workshop Act ; Workmen's Compensation ; Health Insurance ; Employers' Liability ; Rivers Pollution Act ; Industrial and Provident Societies Act ; Sale of Food and Drugs Act ; Milk and Dairies Acts, and other Legislation as it affects the Working of Factories and the Manufacture and Sale of Dairy Produce.

The Entry Fee for each Candidate is fixed at £4 4s.

Particulars and Entry Forms may be obtained from

THE SECRETARY,

BRITISH DAIRY FARMERS' ASSOCIATION,

28, Russell Square, London, W.C. 1.

EXAMINATIONS

AT

LOCAL CENTRES.

In order to meet the convenience of Students at Dairy Schools, members of local Societies, and other persons, the Association will conduct Examinations for its Diplomas and Certificates at any place in the United Kingdom upon receiving satisfactory proof that the following conditions will be observed :—

That the School, Society, County Council, or other body requesting such an Examination to be held, undertake :—

- (1) To supply all necessary appliances and materials.
- (2) To pay the fees and expenses of the Examiners.
- (3) To supply the milk required free from preservatives and fit for Cheesemaking.

Copies of Question Papers set at recent examinations may be obtained at 3d. per copy.

Applicants are requested to state whether Diploma, Cheese, or Butter Questions are required.

Further particulars and Entry Forms for Students may be obtained from
The SECRETARY,

BRITISH DAIRY FARMERS' ASSOCIATION,

28, Russell Square, London, W.C. 1.

EXAMINATION FOR BUTTERMAKING CERTIFICATES AT
THE UNIVERSITY COLLEGE OF SOUTH WALES AND
MONMOUTHSHIRE, CARDIFF; ON WEDNESDAY AND
THURSDAY, MAY 17TH AND 18TH, 1916.

EXAMINER: F. J. LLOYD, F.C.S., F.I.C.

Three hours are allowed for this paper.

Candidates will also be examined *vis a voce* by the Examiner. Each question carries the same number of marks, and candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible, brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner. The top sheet should bear the name and number of the candidate.

QUESTIONS.

1. State briefly the important points to be considered when milking, and after each give the reason for observing it.
2. Give what you consider the average composition of morning's milk at this time of year.
3. What is the chief change which milk is liable to undergo? State the conditions which promote this change.
4. What tests could you apply to milk to determine its cleanliness and suitability for drinking or buttermaking?
5. State the three chief advantages of using a separator for obtaining cream.
6. What are the chief results you ought to obtain by properly ripening the cream? State for each, why.
7. What methods are there for determining when cream is ripe and fit for churning?
8. What faults must be avoided when churning?
9. What is the composition of good butter?
10. What are the most frequent faults in butter? State for each its cause.

EXAMINATION FOR CHEESEMAKING CERTIFICATES AT
THE BRITISH DAIRY INSTITUTE, READING; ON
TUESDAY, THURSDAY, AND FRIDAY, JUNE 6TH, 8TH,
AND 9TH, 1916.

EXAMINERS: JOSEPH RIGBY and F. J. LLOYD, F.C.S., F.I.C.

Three hours are allowed for this paper.

Candidates will also be examined *visu voce* by each Examiner. Each question carries the same number of marks, and Candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in the left-hand corner. The top sheet should bear the name of the Candidate.

QUESTIONS.

1. Enumerate the different breeds of cattle suitable for a cheese-making dairy, and give reasons for your preference.
2. How do soils and pastures affect milk in its relation to cheese-making?
3. In which months of the year does milk give the best results in cheesemaking, and in which the worst?
4. What are the advantages and disadvantages of using a "starter" in a cheese dairy?
5. Describe the testing of milk for acidity before renneting. State how you would treat milk if found over-ripe, and how if under-ripe.
6. What fault should be avoided when breaking down and scalding curd?
7. Describe the texture of good, bad, and indifferent curd at the time of vatting.
8. What are the actions of rennet and salt on curd, and when are the quantities varied?
9. Point out how faults in making may be detected when cheese are under press.
10. Describe the most suitable conditions of a curing room and its construction.

EXAMINATION FOR BUTTERMILKING CERTIFICATES AT
THE BRITISH DAIRY INSTITUTE, READING; ON
TUESDAY, THURSDAY, AND FRIDAY, JUNE 6TH, 8TH,
AND 9TH, 1916.

EXAMINERS: C. W. WALKER TISDALE
AND F. J. LLOYD, F.C.S., F.I.C.

Three hours are allowed for this paper.

Candidates will also be examined *viva voce* by each Examiner. Each question carries the same number of marks, and candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner. The top sheet should bear the name of the candidate.

QUESTIONS.

1. If setting up a small herd for buttermaking, what breed of cows would you recommend? State the average per cent. of fat you would expect to find in the milk of these cows; the probable yield of milk per cow per annum; the probable yield of butter per cow per annum; and the butter ratio of such milk.
2. Describe the lactometer and its use. Assuming milk contains $3\frac{1}{2}$ per cent. of fat, how, by means of the lactometer, could you ascertain the amount of total solids in the milk.
3. Milk containing 3·8 per cent. of fat is separated, and from it 8 per cent. of cream is taken off; what per cent. of fat would be present in the cream?
4. Explain the advantages and disadvantages of making butter from perfectly sweet cream.
5. If butter realises 1s. 8d. per lb., and the value of separated milk for feeding purposes is 3d. per gallon, show which would pay better, to sell milk at 10d. per gallon, or to make it into butter.
6. State all the factors that are likely to prevent cream churning readily.
7. What amount of salt would you add to butter to produce a medium salt flavour; and which method of salting, adding dry salt or brining the butter, would you recommend at the present time?
8. Two samples of butter are given you for examination, one good, the other bad. State respectively the points of the good and bad butter you would observe in your examination of the samples.
9. What is the chief change which milk is liable to undergo? State the conditions which promote this change.
10. What tests could you apply to milk to determine its cleanliness and suitability for drinking or buttermaking?

EXAMINATION FOR CHEESEMAKING CERTIFICATE AT
THE DAIRY DEPARTMENT, COUNTY LABORATORIES
CHELMSFORD; ON TUESDAY, WEDNESDAY, AND
THURSDAY, JULY 25TH, 26TH, AND 27TH, 1916.

EXAMINERS: MR. ALEC TODD and MR. F. J. LLOYD, F.C.S.

Candidates will be allowed $2\frac{1}{2}$ hours to answer the questions contained on this sheet.

Candidates will also be examined *visu voce*. Each question carries the same number of marks, and Candidates gaining over 69 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner.

QUESTIONS.

1. What are the main influences which affect the cheese yield from milk?
2. What are the functions of acidity, heat, and salt, as applied to cheesemaking?
3. How do you account for a Wensleydale cheese going blue? What is the mould found in such a cheese, and what effect has this mould on the ripening?
4. How does a Cheshire cheese differ from a Cheddar, and a Derby cheese from either? What are the chief points in the making of any one of the varieties mentioned?
5. What are the chief by-products found in a dairy? What is their composition, and how are they utilised?
6. How is rennet produced, and what is its action upon milk?
7. What would be the effect on hard-pressed cheese if the curing room reached 80° F. on six successive days?
8. What is a starter? Is it always necessary to use it in cheesemaking, and what bad results might follow the use of too much starter?
9. Explain the difference between the ripening of a soft and of a hard cheese.
10. Give three causes of inferior cheese, and state for each its effect.

EXAMINATION FOR BUTTERMAKING CERTIFICATE AT
THE DAIRY DEPARTMENT, COUNTY LABORATORIES,
CHELMSFORD; ON TUESDAY, WEDNESDAY, AND
THURSDAY, JULY 25TH, 26TH, AND 27TH, 1916.

EXAMINERS: MR. ALEC TODD and MR. F. J. LLOYD, F.C.S.

Candidates will be allowed 2½ hours to answer the questions contained on this sheet.

Candidates will also be examined *viva voce*. Each question carries the same number of marks, and Candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner.

QUESTIONS.

1. What causes which affect the composition of milk are under the control of the farmer?
2. Describe briefly how milk should be treated from the time it is drawn until separated.
3. What are the chief causes of fermentation or taints in milk which may affect the butter made from it?
4. If you were separating 100 gallons of milk for butter making, how much cream and how much separated milk would you expect to get?
5. Would the cream so obtained be thick or thin; which would be better for buttermaking, and why?
6. What changes take place when cream is ripened?
7. What advantages are obtained by ripening cream?
8. Give three causes of inferior butter, and state for each in what respect the butter would be inferior.
9. Why do you use a starter?
10. State for the principal breeds how many pounds of milk are required to make 1 lb. of butter.

EXAMINATION FOR CHEESEMAKING CERTIFICATES AT
THE UNIVERSITY COLLEGE OF SOUTH WALES AND
MONMOUTHSHIRE, CARDIFF; ON WEDNESDAY,
THURSDAY, AND FRIDAY, AUGUST 9TH, 10TH, AND 11TH,
1916.

EXAMINERS: F. J. LLOYD, F.C.S., F.I.C., AND ALEC TODD.

Candidates will be allowed three hours to answer the questions contained on this sheet.

Candidates will also be examined *viva voce* by the Examiner. Each question carries the same number of marks, and candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible, brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner. The top sheet should bear the name and number of the candidate.

QUESTIONS.

1. What characteristics do you like in milk which you consider to be suitable for—
 - (a) Milk retailing;
 - (b) Cheesemaking?
2. Is there any advantage in pasteurising milk for cheesemaking? How would you deal with such milk for this purpose?
3. What are the chief cheesemaking constituents in milk? Which one of these if taken away would make cheesemaking impossible?
4. How is rennet prepared and used? What does it cost per gallon?
5. How do you control acidity in cheesemaking, and why is it essential to the making of all varieties?
6. What are the conditions which give accurate rennet and soda tests?
7. How does a Caerphilly cheese differ from a Cheddar, and a Wensleydale from either?
8. What is the mould found in a Wensleydale cheese? Why does it grow, and what conditions would prevent its growth?
9. Why are cheeses pressed? What pressure is usually put on Cheddar and Caerphilly?
10. What are the chief by-products found in a dairy? What is their composition, and how are they used?

EXAMINATION FOR DAIRY TEACHERS' CERTIFICATES
AT THE BRITISH DAIRY INSTITUTE, READING; ON
MONDAY, TUESDAY, WEDNESDAY, AND THURSDAY,
SEPTEMBER 11TH, 12TH, 13TH, AND 14TH, 1916.

EXAMINERS: MR. JOSEPH RIGBY, MR. C. W. WALKER-TISDALE,
and MR. F. J. LLOYD, F.C.S.

Three hours are allotted to Candidates to answer the questions contained on this sheet.

Each question carries the same number of marks, and Candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner.

Candidates will also be examined *visa voce*.

DAIRYING QUESTIONS.

1. Having taken a Dairy Farm where 25 cows may conveniently be kept; state all the points which would enable you to decide which would pay best.
 1. To sell milk.
 2. To make butter.
 3. To make cheese.
2. State exactly how you would institute a system of keeping Milk Records and all the advantages to be gained thereby.
3. You are selling milk and receive a Report that a sample taken from your supply showed a deficiency of 15 % Butter Fat. If you know for certain that this milk has not been tampered with, what other causes can be given to explain the deficiency?
4. What do you understand by Pasteurization and what are its practical advantages? State also the disadvantages of Pasteurization.
5. In making Cheddar cheese you find at the later stages in development of Acid the Acidity decreases instead of increases. Explain the causes, for this and how it would influence the ripening of the cheese.
6. You are appointed itinerant Instructor in a County where cheesemaking is practised, and the object of the appointment is to improve the cheesemaking at the farms. If given a free hand what plan of work would you suggest carrying out?
7. Describe some of the purchased Feeding Stuffs mostly used for dairy stock.
8. Give two suitable rations for dairy cows in winter, stating their cost and relative merits.
9. What system of Book-keeping is suitable for a Dairy.
10. How would you explain to a class the difference between the dairying of 30 years ago and of the present time.

EXAMINATION FOR DAIRY TEACHERS' CERTIFICATES
AT THE BRITISH DAIRY INSTITUTE, READING; ON
MONDAY, TUESDAY, WEDNESDAY, AND THURSDAY,
SEPTEMBER 11TH, 12TH, 13TH, AND 14TH, 1916.

EXAMINERS: MR. JOSEPH RIGBY, MR. C. W. WALKER-TISDALE,
and MR. F. J. LLOYD, F.C.S.

SECOND PAPER.

Teacher's Certificate Candidates will be allowed 3 hours to answer the following questions:—

DAIRY CHEMISTRY QUESTIONS.

1. State how you would demonstrate to a class that milk contains its various constituents.
2. What chemical changes take place in milk when it is heated to 180° F.?
3. What chemical changes take place during the manufacture of a Cheddar cheese?
4. Compare the chemical composition of separated milk with that of whey, and explain how and why their value as feeding stuffs is consequently affected.

DAIRY BACTERIOLOGY QUESTIONS.

5. How would you prepare a slide of sour milk for microscopic examination of the bacteria present?
6. You have so prepared slides of (a) milk soured naturally; (b) milk soured with a pure culture of streptococcus lactis. Describe what difference in appearance would be visible, and explain why.
7. Describe some of the organisms which produce a spongy curd.
8. What mould is present in a Stilton cheese? How would you cultivate it and examine it to determine its variety and purity?

EXAMINATION FOR CHEESEMAKING CERTIFICATES AT
THE BRITISH DAIRY INSTITUTE, READING; ON
MONDAY, TUESDAY, WEDNESDAY, AND THURSDAY,
SEPTEMBER 11TH, 12TH, 13TH, AND 14TH, 1916.

EXAMINERS: JOSEPH RIGBY and F. J. LLOYD, F.C.S., F.I.C.

Three hours are allowed for this paper.

Candidates will also be examined *visu roce* by each Examiner. Each question carries the same number of marks, and Candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in the left-hand corner. The top sheet should bear the name of the Candidate.

QUESTIONS.

1. Do pastures influence the keeping qualities of milk, if so, in what way?
2. Describe the treatment of the evening's milk during a cheesemaking season. How would you vary it?
3. Why is milk ripened for cheesemaking? What causes ripening?
4. Name a kind of cheese made twice daily from newly drawn Milk and describe how ripening is encouraged or retarded in the curd?
5. At what stage of making may you expect faults of ripening of the milk, or taints to show themselves, and how would you deal with them?
6. Describe the difference in making between early ripening and long keeping cheese?
7. What yield of milk and cheese would you consider a profitable one from a herd of 30 newly calved cows between April 1st and September 30th?
8. Describe the appearance of faulty made cheese when taken from under press the morning after being made?
9. What is rennet? How would you prepare it, and how test it when made?
10. In what respects should the manufacture of whey-butter differ from that of ordinary butter?

EXAMINATION FOR BUTTERMaking CERTIFICATES AT
THE BRITISH DAIRY INSTITUTE, READING; ON
MONDAY, TUESDAY, WEDNESDAY, AND THURSDAY,
SEPTEMBER 11TH, 12TH, 13TH, AND 14TH, 1916.

EXAMINERS: C. W. WALKER TISDALE
AND F. J. LLOYD, F.C.S., F.I.C.

Three hours are allowed for this paper.

Candidates will also be examined *visu voce* by each Examiner. Each question carries the same number of marks, and candidates gaining over 60 per cent. will pass.

Candidates are requested to make their answers as brief as possible—brief and accurate. Each answer should be written on a separate sheet of paper, and subsequently the sheets should be fastened together in order in the left-hand corner. The top sheet should bear the name of the candidate.

QUESTIONS.

1. If 3 gallons of milk are required to make 1 lb. of butter, what would you suggest is at fault? How would you recommend the yield might be improved?
2. State the approximate yield per annum of a good dairy cow, and show what would be the financial returns when converting this milk into butter and allowing for the value of the bye-products.
3. If milk contains 3.9 per cent. of butter fat, show by calculation how many gallons of such milk it would take to make 1 lb. of butter.
4. For what purpose is salt added to butter? State under what conditions you would vary the amount of salt used.
5. State the average percentage composition of butter, and explain how excess or deficiency of
 1. Water;
 2. Curd;
 3. Saltaffect the keeping qualities of butter.
6. Why is cream ripened preparatory to being churned?
7. When ripening and churning cream in very hot weather where no ice is obtainable, what points require particular attention?
8. What are the causes of rancidity of butter? How would you prevent it?
9. Give in tabular form all the essential requirements for a separator to work efficiently.
10. What are the characteristics of perfect butter?

EXAMINATION RESULTS, 1916.

EXAMINATION FOR BUTTERMaking CERTIFICATES AT THE UNIVERSITY COLLEGE OF SOUTH WALES AND MONMOUTH-SHIRE, CARDIFF, ON WEDNESDAY AND THURSDAY, MAY 17TH AND 18TH, 1916.

A Certificate of Merit for Proficiency in the Theory and Practice of Butter-making to Miss Florence M. Harris, Miss Elizabeth Howell, Miss Mary A. Howell, Miss Lily Miles, Miss Mary Tucker, Miss Annie M. Williams, Miss Margaret M. Jones, Miss Mar'e Jones, Miss Melita Nicholas, Miss Mary Pritchard, Miss Bettie Williams, and Miss Joanna Williams.

EXAMINATION FOR BUTTERMaking AND CHEESEMAKING, CERTIFICATES AT THE BRITISH DAIRY INSTITUTE, READING ON TUESDAY, THURSDAY, AND FRIDAY, JUNE 6TH, 8TH, AND 9TH.

A Certificate of Merit for Proficiency in the Theory and Practice of Butter-making to Miss Mildred R. S. Wilkinson, Victor L. Ramsay, Miss Marian Clinton-Baddeley, Miss Betty K. Bevan, Miss Jessica G. Robinson, Miss Jean Ritchie, Thomas D. Potter, Miss Pauline E. Brehm, Miss Frances M. Ekless, Alison Holmes, Miss Agatha E. Twining, Miss Amy E. S. Beasley, and Mrs. Rosalind N. Lange.

A Certificate of Merit for Proficiency in the Theory and Practice of Cheese-making to Walter Rushton.

EXAMINATION FOR TEACHERS' BUTTERMaking AND CHEESE-MAKING CERTIFICATES AT THE COUNTY DAIRY SCHOOL, CHELMSFORD, ON TUESDAY, WEDNESDAY, AND THURSDAY, JULY 25TH, 26TH, AND 27TH, 1916.

A Certificate of Merit for Proficiency in the Theory and Practice of Butter-making to Miss Ethel F. Claridge-Turner, Miss Evelyn G. Partridge, Miss Grace Graydon, Miss Avis Colnett, Miss Winifred E. Ruthen, Miss Ellen Titmuss, Miss Elsie L. Mules, and Miss Frances A. Rogers.

A Certificate of Merit for Proficiency in the Theory of Cheesemaking and having shown skill in the manufacture of Cheddar Truckles and Wensleydale Cheese to Miss Ethel F. Claridge-Turner and Miss Evelyn G. Partridge.

A Certificate of Merit for Proficiency in the Theory of Cheesemaking and having shown skill in the manufacture of Derby and Wensleydale Cheese to Miss Grace Graydon.

EXAMINATION FOR CHEESEMAKING CERTIFICATES AT THE
UNIVERSITY COLLEGE OF SOUTH WALES AND MONMOUTH-
SHIRE, CARDIFF; ON WEDNESDAY, THURSDAY, AND FRIDAY,
AUGUST 9TH, 10TH, AND 11TH, 1916.

- A Certificate of Merit for Proficiency in the Theory of Cheesemaking and having shown skill in the manufacture of Cheddar Truckles and Wensleydale Cheese to Miss Sarah Benyon and Miss Miriam M. Davies.
- A Certificate of Merit for Proficiency in the Theory of Cheesemaking and having shown skill in the manufacture of Caerphilly (5 lbs.) and Wensleydale Cheese to Miss Janet A. Evans, Miss Margaret M. Jones, Miss Marie Jones, Leopold A. Liventhal, Miss Winifred M. Phillips, and Miss Mary Tucker.

EXAMINATION FOR DIPLOMAS AND CERTIFICATES AT THE
BRITISH DAIRY INSTITUTE, READING, ON TUESDAY,
WEDNESDAY, AND THURSDAY, SEPTEMBER 12TH, 13TH, AND
14TH, 1916.

- A Certificate of Merit for Proficiency in the Theory and Practice of Cheese-making to Miss Mildred R. S. Wilkinson and Miss Pauline E. Brehm.
- A Certificate of Merit for Proficiency in the Theory and Practice of Butter-making to Miss Kathleen Isobel Maitland, Miss Margaret M. Maitland, Bernado Izquierdo, Federico Gonzalez, Miss Jessie M. Podmore, Miss Ethel L. Malpas, and Jamieson Muir.

British Dairy Farmers' Association.

MEDAL SCHEME.

Special Prizes at Educational Institutions and Country Shows.

The Council of the British Dairy Farmers' Association is prepared to consider applications from Educational Centres and Approved Societies in the United Kingdom for their Silver and Bronze Medals to be awarded in connection with dairying and dairy farming under the following conditions, viz. :—

1. All applications must be made on the official form and must clearly state the object for which the Medal or Medals are required.
2. Only one application from any Institution or Society can be considered in any one year.
3. The application must be repeated annually if Medals are again required.
4. A copy of the Proposed Prize List, showing the Conditions of the Award of the Medal and the name of the judge, should accompany the application, and the offer of a Medal cannot be confirmed until the Prize List has been approved.
5. The British Dairy Farmers' Association stipulates that no entry fee shall be charged in respect of these Medals, they being offered as *Special Extra Prizes*.
6. Notification of the award, with the winner's full name and address, to be forwarded to the Secretary, British Dairy Farmers' Association, 28, Russell Square, London, W.C. 1, within 14 days of the award being made.
7. A person may not receive more than one Medal under this Scheme for the same subject or exhibit during any one year.

In the event of any dispute as to the interpretation of these Rules, the Council of the British Dairy Farmers' Association reserve full power of decision, and in the event of the Medal not being awarded in accordance with the above Rules and Conditions, the Council reserve the right to withhold the Medal altogether.

Particulars and Entry Forms may be obtained from

THE SECRETARY,
British Dairy Farmers' Association,
28, Russell Square, London, W.C. 1.

AWARDS DURING 1916.

| Name of Society. | Show or Examination held at | Date. | Medal. | Winner and Object. |
|--|-----------------------------|--------------|--------|---|
| University College of South Wales | Cardiff | May 17 & 18 | Bronze | Miss Mary Pritchard, for highest marks in B. D. F. A. Buttermaking Examination. |
| Cheshire Dairy Farmers' Association | Chester | Oct. 3 | Silver | E. Jones, for best lot of Cheese in Classes 6 and 7. |
| Gloucestershire Root, Fruit, and Grain Society | Gloucester | Nov. 9 | " | W. J. Brooke, for best exhibit of Butter in Show. |
| Whitechurch Dairy Farmers' Association | Whitechurch | " 21 & 22 | " | J. F. R. Huntback, for best Cheese in Show. |
| " | " | " 21 & 22 | Bronze | Miss A. L. Wainwright, for best exhibit of Butter in the Show. |
| Lancashire County Council | Lancaster | Nov. | Silver | Miss Doris Postlethwaite, as winner of Dairy Diploma Examination. |
| Monmouthshire Agricultural Committee | Education Newport | Dec. 14 & 15 | " | |
| " | " | " | Bronze | |

HALF-YEARLY REPORT OF THE COUNCIL TO THE MEMBERS, PRESENTED TO THE MEETING HELD AT THEIR OFFICES, 28, RUSSELL SQUARE, LONDON, W.C., 6th DECEMBER, 1916.

In presenting this Report to the Members at the 41st Half-yearly Meeting, the Council have again to announce a falling off of Members of the Association on account of so many joining the War, but in many cases it is asked to let the matter of Subscriptions stand over till the end of the War.

It is with great regret the Council have to report the great loss the Association has sustained in the death of Mr. John Lee of Ellesmere, who has been a Member for twenty years, and for several years a very active Member of the Council.

As last year the Dairy Conference was not held.

The Medal Distribution Scheme still continues, and we have given this year as follows :—

The Lancashire County Council, Preston—

Silver Medal to the best Dairy Diploma Student now attending the County Council Farm.

Gloucester Root, Fruit, and Grain Society—

Silver Medal to the Best Exhibit of Butter in the Show.

*Penistone Agricultural Society—

Silver Medal for the Best Dairy Cow in class 31,

University College of South Wales and Monmouthshire, Cardiff—

Bronze Medal to the Candidate gaining highest points in the British Dairy Farmers' Association Butter-making Examination.

Cheshire Dairy Farmers' Association, Chester—

Silver Medal for the best lot of Cheese exhibited in classes 6 and 7.

Whitechurch Dairy Farmers' Association, Whitechurch, Salop—

Silver Medal for Best Cheese in the Show.

Bronze Medal for Best Butter in the Show.

Lord Desborough has honoured the Council by allowing his name to be submitted as President for 1917, and your vote in support of the Council is desired.

* This Medal was not given on account of insufficient entries.

The following list of Vice-Presidents has also been prepared :—

The Marquis of Crewe, K.G.
 The Lord Northbourne.
 The Lord Kenyon.
 The Lord Strachie.
 Sir Gilbert Greenall, Bart., C.V.O.
 Sir Mark J. McTaggart Stewart, Bart.
 Right Hon. Jesse Collings.
 George Barbour, Esq., J.P.
 S. Palgrave Page, Esq., J.P.
 John Welford, Esq., J.P.
 G. Titus Barham, Esq.
 and the retiring President, Lord O'Hagan.

In accordance with the Articles of Association the following Members of the Council retire by rotation, viz. :—

Mr. W. Asheroft (Croydon), Mr. W. S. Brocklehurst (Bedford), Mr. E. H. Clarke (Leicester), Mr. L. M. Douglas (Edinburgh), Mr. W. H. Edwards (Devon), Capt. R. Oliver-Bellasis (Coventry), Mr. J. Rigby (South Croxton), Mr. J. C. Robinson (Lewes), Mr. J. Sadler (Cheshire), Mr. J. A. Smith (Ipswich), Mr. E. G. F. Walker (Bristol), and Mr. S. R. Whitley (Reading).

All the above, with the exception of Mr. L. M. Douglas, are willing to be re-elected, having been duly nominated by a member not already holding a seat on the Council.

The following new Candidates also seek election on the Council :—

Mr. W. J. Golding, Westwood Farm, Weald, Kent.
 Mr. Thomas Hawes, Benthill, Buckingham.
 Mr. J. M. Longe, Colney Farm, Harefield Park, Middlesex.
 Mr. E. J. Lovell, 12, West Smithfield, E.C.
 Mr. James Mackintosh, University College, Reading.
 Mr. Sam Woodiwiss, Graveleys, Great Waltham, near Chelmsford.

The result of the election will be declared at a later stage of this meeting.

At the Annual General Meeting of Members on the 7th July, 1916, after prolonged discussion, it was decided to abandon the Dairy Show, as they were of opinion that it would not be possible to have anything like a representative Exhibition.

Lord Strachie moved the following Resolution, which was unanimously adopted, and ordered to be sent to the Local Government Board :—

“That the Annual Meeting of Members of the British Dairy Farmers' Association urge upon the Local Government Board the importance of issuing at once the New Regulations in regard to the Exemption of Men employed in Agricultural Work, which have been agreed to between the War Office and the Board of Agriculture.”

The following Resolution, framed by the Northallerton Agricultural Club, having been considered, it was agreed to support same, and instructions were given to communicate with the Board of Agriculture on the matter.

The Resolution reads as follows :—

“ Resolved that in the opinion of this Club it is desirable and essential for the Farmers and Cattle Dealers in this Country that some alteration in the Law should be made by which Railway Companies should be held responsible for all injuries to Stock entrusted to them for carriage which is proved to have been in a sound, healthy condition when trucked by the Railway Company, and that it should not be essential for the sender of stock to prove negligence by the Company. The Injured Animals Act, 1907, should be amended so as to make notice of slaughter compulsory, and give the owner of slaughtered animals power, if desired, to view and deal with carcasses.”

In answer to the above the following letter was received from the Board of Agriculture and Fisheries :—

“ Whitehall Place, S.W.,

“ 20th June, 1916.

“ Sir,

“ I am directed by the President of the Board of Agriculture and Fisheries to refer to your letter of the 8th inst. containing a copy of a Resolution passed by the Council of the British Dairy Farmers' Association on the subject of injury to cattle on rail, and to suggest that it might be desirable for your Association later on to bring this matter before the Royal Commission on Railways, the name and address of whose Secretary is Mr. E. W. Rowntree, Board of Trade, 1, Whitehall Gardens, S.W.

“ The Committee is not sitting at present, and it would appear to be advisable that the matter should be allowed to rest until the War is over.

“ I am to add that the suggested amendment of the Injured Animals Act, 1907, has been brought to the notice of the Home Office for consideration.

“ I am, Sir,

“ Your obedient Servant,

(Signed) “ T. H. MIDDLETON,

“ Assistant Secretary.

“ To the British Dairy Farmers' Association.”

A Resolution was passed on the 7th June, 1916, by the Council re The British Dairy Institute, University College, Reading.

“ That the British Dairy Farmers' Association will grant Attendance Certificates to those six months' Cheese Students who are recommended by Mr. Alec. Todd as having shown due diligence in their studies during that period.”

At the Council Meeting on July 12th, Lord Strachie moved the following Resolution, which was seconded by Mr. S. Palgrave Page, and unanimously adopted and ordered to be forwarded to the Earl of Selborne:—

“That the Council of the British Dairy Farmers’ Association desires to record its sense of the loss that the Dairy Farming interest has sustained by the resignation of the Earl of Selborne, K.G., of the Presidency of the Board of Agriculture and Fisheries.”

At the Council Meeting, October 18th, a letter was read from the Cambridgeshire and Isle of Ely Chamber of Agriculture asking for subscriptions towards the expense of Cost of Action, “*Hunt v. Richardson*,” a full account of this action is published in the Supplement to Fourth Edition of Section 11, in Bibby’s Book on Milk, and printed by the P. P. Press (J. Bibby & Sons), King Edward Street, Liverpool.

By order of the Council.

B. RAVENSCROFT,

Acting Secretary.

28, RUSSELL SQUARE,
LONDON, W.C. 1,
November, 1916.

FORTY-FIRST

ANNUAL REPORT OF THE COUNCIL

to the General Meeting of Members.

Wednesday, June 6th, 1917.

Notwithstanding the War, the work of the Association has been carried on.

At the close of 1915 there were 1,198 members, 18 new members have been elected since and 50 have resigned or died, leaving a total of 1,166, made up of 1,078 Annual, 83 Life, and 5 Honorary Members. There are 14 Kindred Societies affiliated with 14 delegates on the Council.

In December last, at the Half-Yearly Meeting, there were three new members elected on the Council, namely, Mr. W. J. Golding, Westwood Farm, Weald, Kent; Mr. James Mackintosh, of the University College, Reading; and Mr. Sam Woodiwiss, of Sedgemere Stud, Great Waltham, Chelmsford.

On the other hand the Council deeply regret the death of Mr. L. C. Verrey, who was not only a very regular attendant at its meetings, but also for many years Steward of the Poultry Department of the Dairy Show.

The Financial Statement for the year ending December 31st, 1916, is attached hereto.

The Dairy Conference and Tour, as last year, was abandoned.

In Education we held five Examinations for Butter and Cheese-making; the Spring and Autumn Examinations at the British Dairy Institute, Reading; the Spring and Autumn Examinations at Cardiff for the University College of South Wales and Monmouthshire; and

one at Chelmsford for the Essex County Dairy School. The following awards resulted, viz. :—

| | Buttermaking. | Cheesemaking. |
|--------------------------------------|---------------|---------------|
| British Dairy Institute, Reading ... | 20 | 3 |
| Cardiff ... | 12 | 8 |
| Chelmsford ... | 8 | 3 |
| | — | — |
| | 40 | 14 |

MEDAL DISTRIBUTION SCHEME.

There were held about the same number of Shows as in the previous year, 1915, and applications for Medals were received from Kindred Societies and Educational Institutes. The following grants were made :—

| | Silver. | Bronze. |
|------------------|---------|---------|
| Butter ... | 1 | 1 |
| Cheese ... | 2 | — |
| Buttermaking ... | — | 1 |
| Examinations ... | 2 | 1 |

Re PRICE OF MILK ORDER.

A letter was received from the National Federation of Agricultural Co-operative Dairy Societies, dated the 6th December, 1916, saying that they decided to ask the President of the Board of Trade to receive a Deputation on the above subject, and asking us to send a representative, which was agreed to.

The Meeting was fixed for 3rd January, and the Deputation met here in the Council Room to discuss the subject prior to their Meeting. There were about 26 representatives present from all parts of England, several representing many Societies. At the Ministry of Food it was suggested by Captain Bathurst that it would be much better in future interviews with him to have a small Executive Committee rather than large Deputation. It was arranged that Mr. Primrose McConnell represent the British Dairy Farmers' Association on the Executive.

British Dairy Farmers' Association.

FINANCIAL STATEMENTS.

Gr. GENERAL INCOME AND EXPENDITURE ACCOUNT for the Year ended December 31st, 1916. Cr

| EXPENDITURE. | | INCOME. | |
|--|-----------|---|-----------|
| | £ s. d. | | £ s. d. |
| British Dairy Institute, Reading— | | Subscriptions and Donations | ... |
| Current year's work | 200 0 0 | Examinations | ... |
| Education and Examinations | 90 15 6 | Journal | ... |
| Journal... | 231 1 11 | Contributions to Prize Fund | ... |
| Medal Scheme | 5 11 3 | Entry Fees—Competitions and Non-Competition | ... |
| Prizes to Exhibitors | 5 7 0 | Catalogue Sales and Advertisements | ... |
| Reserve Account | 154 12 11 | Interest on Investments | ... |
| Bad Debt | 12 10 0 | BALANCE, being excess of Expenditure over | ... |
| Rent | 240 0 0 | Income | 1,343 0 5 |
| Salaries and Wages | 301 13 0 | | |
| Printing, Stationery, Postages, Advertising, and | | | |
| Sundry Office Expenses | 161 4 10 | | |
| Law Charges | 64 8 0 | | |
| Auditors' Fees and Officers' Retaining Fees | 54 12 0 | | |
| Loss on Realization of Investment | 689 16 4 | | |
| Depreciation of Furniture | 20 5 6 | | |

£2,211 18 3

£2,211 18 3

STATEMENT OF ASSETS AND LIABILITIES, December 31st, 1916.

| Dr. | STATEMENT OF ASSETS AND LIABILITIES, December 31st, 1916. | | Cr. |
|-------------------------------------|---|------------|------------|
| | LIABILITIES. | £ s. d. | £ s. d. |
| Sundry Creditors | | 342 14 11 | |
| Conference Cash | | 35 0 3 | |
| Less Balance at last Account | | 19 3 9 | |
| | | — | 15 16 6 |
| Surplus of Assets over Liabilities— | | | |
| As at December 31st, 1915 | | 3,490 11 0 | |
| Deduct—Excess of Expenditure over | | | |
| Income | | 1,343 0 5 | |
| | | — | 2,147 10 7 |
| | ASSETS. | £ s. d. | £ s. d. |
| | Investments at Cost :— | | |
| | £500 L. & S.W. Railway 3 per cent. Debtenture Stock | 523 7 4 | |
| | £500 L. & N. W. Railway 3 cent. Debtenture Stock | 443 16 3 | |
| | £500 India 3 per cent. Stock | 377 11 0 | |
| | | — | 1,344 14 7 |
| | Furniture | 202 15 7 | |
| | Less 10 per cent. depreciation | 20 5 6 | |
| | | — | 182 10 1 |
| | British Dairy Institute: Value of Ap- pliances transferred to Reading | 160 18 2 | |
| | Sundry Debtors | 24 0 10 | |
| | Cash at Bankers and in hand | 793 18 4 | |
| | | — | £2,506 2 0 |

REPORT OF THE AUDITORS TO THE MEMBERS OF THE BRITISH DAIRY FARMERS' ASSOCIATION.

We have audited the foregoing Statement of Assets and Liabilities and the Income and Expenditure Account with the books and accounts of the Association. We have received all the information and explanations we have required. In our opinion such Statement of Assets and Liabilities is a full and fair statement containing the particulars required by the Regulations of the Association, and properly drawn up so as to exhibit a true and correct view of the state of the Association's affairs according to the information and explanations we have received and as shown by the Books.

HARRY DUNN;
PERCY T. HAY;

Authors.

ANNAN, DEXTER & CO.,
Chartered Accountants.

21, Ironmonger Lane, London, E.C. 2,
May 15th, 1917.

THE British Dairy Farmers' Association.



THE OBJECTS OF THE ASSOCIATION

are the improvement of

DAIRY STOCK AND DAIRY PRODUCE,

by encouraging the Breeding and Rearing of Stock for the special purpose of the Dairy; a larger and more general production of Butter, Cheese, and Eggs; the Erection of Improved Dairy Buildings, and the Invention of New or Improved Dairy Utensils, Machinery, Implements, and Scientific Appliances. The Association also stimulates the Breeding and Rearing of Poultry, &c. By means of Papers in the Society's *Journal* (published annually), Annual Conferences in different dairy districts, Lectures, and Discussions, and in other ways, efforts are continually being made to disseminate a more thorough knowledge of Dairy husbandry.

Prizes to the value of about £3,500 are annually offered for competition at the Dairy Show held at the Royal Agricultural Hall, Islington, London.

It is difficult to over-estimate the importance and need of greater attention being paid to the Dairy industry. It is admitted that by improved modes of managing Milk and its products, the wealth obtained from the Milch Cows of the country could be increased most materially. The Council, therefore, appeal to Agriculturists of all classes, and Dairy Farmers in particular, who, by becoming Members of the Association, will practically aid in developing its usefulness.

The advantages of Membership comprise :—

- 1.—A free pass to all the Society's Dairy Shows, available each day during the Exhibition, with the privilege of admitting free (by ticket) a friend on any one day.
- 2.—The privilege of participating at specially low charges in the Dairy Conferences at home or abroad, organised by the Association.
- 3.—The Exhibition of Live Stock, Dairy Produce, and Utensils, at a reduced scale of fees.
- 4.—A copy (free by post) of the *Journal* of the Association, published annually; price 1s. to non-members.
- 5.—Analyses by the Analytical and Consulting Chemist, at low fees, of samples of milk, cream, butter, cheese, feeding stuffs, water, soil, manures, &c., and advice on dairy matters connected with his Department.

- 6.—Professional advice and assistance at a reduced scale of charges, in any case of disease among the live stock of the farm.
- 7.—Examinations by the Consulting Pathological Bacteriologist, for particular pathogenic or disease-producing organisms.
- 8.—Investigations by the Consulting Dairy Bacteriologist into the cause of trouble or taints in dairy produce.
- 9.—In any case of apparent hardship in connection with the administration of the Model Milk Clauses, Members are recommended to at once send details of such case to the Secretary, who will submit the matter to the Committee appointed to deal with such matters, after which, advice and assistance will be given by the Association.

The Annual Subscription is £1, but Dairy Instructors and *bonâ fide* Tenant Farmers are admitted on payment of ros. 6d. per annum. The latter sum entitles Dairy Instructors to all privileges, except the reduced fees for exhibition at the Shows. A *bonâ fide* Tenant Farmer is deemed to be one who rents the whole of the land in his occupation.

MEMBERS' VETERINARY PRIVILEGES.

Members of the Association who require professional assistance in any case of disease among their animals must apply direct to the Consulting Veterinary Surgeon, Mr. SIDNEY VILLAR, F.R.C.V.S., Amersham Common, Bucks, whose scale of charge is as follows:—

| | £ | s. | d. |
|--|---|----|----|
| Personal Consultation | 0 | 10 | 6 |
| Post-mortem Examination and Report | 0 | 10 | 6 |
| Consultation by Letter | 0 | 5 | 0 |
| Visit and Report, in case of an outbreak of disease, in addition to personal and travelling expenses, per day | 2 | 2 | 0 |

MEMBERS' BOTANICAL PRIVILEGES

The Council have fixed the following rates of charge for the examination of Plants and Seeds for the *bonâ fide* and individual use and information of Members of the Association (not being Seedsmen), who are particularly requested to mention the kind of examination they require, and to quote its number in the subjoined Schedule.

| No. | £ | s. | d. |
|---|---|----|----|
| 1.—A Report on the purity, and amount of nature of foreign materials, of a sample of seed | 0 | 1 | 0 |
| 2.—A Report on the perfectness and germinating power of a sample of seed Nos. 1 and 2 together | 0 | 1 | 6 |
| 3.—Determination of the species of any weed or other plant, or of any epiphyte or vegetable parasite, with a report on its habits, and the means for its extermination or prevention | 0 | 1 | 0 |
| 4.—Report on any disease affecting farm crops | 0 | 1 | 0 |
| 5.—Determination of the species of a collection of natural grasses found in any district, with a report on their habits and pasture value | 0 | 4 | 0 |

| | |
|--|--------|
| BUTTER. | |
| Estimation of Water, Fat, Casein, and Ash | 0 10 6 |
| Examination for Foreign Fats | 0 10 6 |

| | | | | | | | £ | s. | d. |
|--|-----|-----|-----|-----|-----|-----|---|----|----|
| CHEESE. | | | | | | | | | |
| Estimation of Water, Fat, Casein, and Ash ... | ... | ... | ... | ... | ... | ... | 0 | 10 | 6 |
| Examination for Foreign Fats ... | ... | ... | ... | ... | ... | ... | 0 | 10 | 6 |
| RENNET. | | | | | | | | | |
| Examination of Strength ... | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| CAKES AND MEALS | | | | | | | | | |
| Estimation of Oil only ... | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| Estimation of Oil, Albuminoids, and Carbo-hydrates ... | ... | ... | ... | ... | ... | ... | 0 | 10 | 6 |
| GRASS, SILAGE, ROOTS, &c. | | | | | | | | | |
| Estimation of Oil, Albuminoids, and Carbo-hydrates, &c. .. | ... | ... | ... | ... | ... | ... | 1 | 1 | 0 |
| MANURES. | | | | | | | | | |
| Estimation of Phosphoric Acid ... | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| Estimation of Soluble and Insoluble Phosphoric Acid ... | ... | ... | ... | ... | ... | ... | 0 | 7 | 6 |
| Estimation of Nitrogen... .. | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| Estimation of Potash | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| SOIL. | | | | | | | | | |
| Estimation of Lime | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| Analysis and Report | ... | ... | ... | ... | ... | ... | 2 | 2 | 0 |
| WATER. | | | | | | | | | |
| Analysis for Drinking or Dairy Purposes | ... | ... | ... | ... | ... | ... | 1 | 1 | 0 |
| POISONS. | | | | | | | | | |
| Examination of a Substance for Mineral Poisons | ... | ... | ... | ... | ... | ... | 2 | 2 | 0 |
| Examination for Organic Poisons (Alkaloids, &c.) | ... | ... | ... | ... | ... | ... | 3 | 3 | 0 |
| CIDER AND FERMENTED DRINKS. | | | | | | | | | |
| Estimation of Alcohol | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| Estimation of Alcohol, Sugar, Acidity, &c. | ... | ... | ... | ... | ... | ... | 0 | 10 | 6 |
| PRESERVATIVES. | | | | | | | | | |
| Examining a Substance for Boracic Acid or Salicylic Acid, &c., for each Substance sought... .. | ... | ... | ... | ... | ... | ... | 0 | 2 | 6 |
| Estimation of the quantity of Boracic Acid | ... | ... | ... | ... | ... | ... | 0 | 10 | 6 |
| Analysis of a Preservative | ... | ... | ... | ... | ... | ... | 1 | 1 | 0 |
| COLOURING MATTER. | | | | | | | | | |
| Examination for Artificial Colouring | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| CONSULTATION | | | | | | | | | |
| For Letter in reply to Enquiry... .. | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| For Personal Interview | ... | ... | ... | ... | ... | ... | 0 | 5 | 0 |
| For Special Consultation | ... | ... | ... | ... | ... | ... | 1 | 1 | 0 |
| NOTE. —The Consulting Chemist will be prepared to quote reduced terms to members requiring a number of analyses at frequent intervals. | | | | | | | | | |

Instructions for Taking Fair Samples for Analysis.

Dairy Produce.—Milk should be sent in a well-corked 8-oz. clear bottle. The milk should quite fill the bottle. Butter or cheese, about 8 ounces; the former in a gallipot well tied down.

Soils.—A block of soil about four or five inches square, and nine inches deep, should be sent in a strong box by rail.

Artificial Manures.—Take a handful of manure out of at least half a dozen bags, mix these rapidly and thoroughly, breaking down all lumps. Forward about a pound of the mixture in a tin box, and retain the remainder. Samples of manure should be sent immediately after the delivery of the bulk, and before settling the account. All manures should be bought subject to analysis.

Feeding Materials.—Feeding cakes, meals, or grains: about a pound should be sent in a bag or box. Grass and hay: a bundle of a few pounds weight. Silage: a six-inch cubic block, packed closely in a box to keep it compressed.

Waters.—A Winchester quart glass-stoppered bottle should be procured from a druggist, well washed out with the water, then completely filled, the stopper tied securely down, and the bottle packed in a box and sent by rail.

N.B.—In order to prevent disappointment, the Chemist requests that as far as possible, Members desiring to hold a personal consultation should make an appointment by letter. Between 12 and 3 are the hours most convenient. The fees for analyses of artificial manures and feeding stuffs are payable in advance, and only applicable to Members who are not commercially engaged in the manufacture or sale of the articles sent for analysis. All communications intended for the Analytical and Consulting Chemist must be addressed direct to Mr. F. J. LLOYD, F.C.S., 135, Queen's Road, Finsbury Park, London, N. 4.

MEMBERS' BACTERIOLOGICAL PRIVILEGES.

EXAMINATIONS BY DR. ANDREWES, Pathological Laboratory,
St. Bartholomew's Hospital, London, E.C.

| MILK. | | £ s. d. | | |
|---|--------|---------|---|---|
| Cultural and experimental examination for a particular pathogenic | | | | |
| organism | | 2 | 2 | 0 |
| PASTEURISED OR STERILISED MILK. | | | | |
| Cultural and experimental examination for a particular pathogenic | | | | |
| organism | | 1 | 1 | 0 |
| CREAM, BUTTER, OR CHEESE. | | | | |
| Cultural and experimental examination for a particular pathogenic | | | | |
| organism | | 2 | 2 | 0 |
| WATER. | | | | |
| Cultural and experimental examination for a particular pathogenic | | | | |
| organism | | 2 | 2 | 0 |

INVESTIGATIONS BY MR. F. J. LLOYD, F.C.S., 135, Queen's Road,
Finsbury Park, London, N. 4., INTO THE CAUSES OF TROUBLE
OR TAINTS IN MILK, CREAM, BUTTER, OR CHEESE.

| MILK. | £ s. d. | | |
|--|---------|----|---|
| Microscopical and cultural examination for a particular organism ... | 2 | 2 | 0 |
| Experimental and cultural examination for a particular organism ... | 5 | 5 | 0 |
| | 10 | 10 | 0 |
| CREAM, BUTTER, CHEESE. | | | |
| Microscopical examination ... | 0 | 10 | 6 |
| Microscopical and cultural examination... | 2 | 2 | 0 |
| PASTEURISED OR STERILISED MILK. | | | |
| Microscopical examination for bacteria ... | 0 | 5 | 0 |
| Estimating number of bacteria present ... | 0 | 10 | 6 |
| Culture examination of bacteria present ... | 2 | 2 | 0 |

Directions for Sending Samples.

Samples of milk or water (one quart) and cream (half pint) should be forwarded in wide-mouthed stoppered bottles which have previously been thoroughly cleaned, and then rinsed several times with very hot, almost boiling, water.

Butter is best sent in a $\frac{1}{2}$ -lb. brick or roll, just as it was made up, wrapped in grease-proof paper, and packed in a box.

If the *Cheese* is small, send a whole one; otherwise forward a square block of not less than one pound and not a wedge-shaped piece. Wrap in grease-proof paper and pack in a box.

All samples should be sent by the speediest method possible. They ought not to arrive either on Saturday or Sunday.

Samples to be examined for disease-producing organisms should be forwarded to Dr. Andrewes, Pathological Laboratory, St. Bartholomew's Hospital, London, E.C. Members are requested to note that in the case of examination for the tubercle bacillus the method of animal inoculation, which experience has shown to be the only reliable one, will be alone used. It is impossible to carry out the process of sedimentation necessary for the detection of tubercle bacillus in milk which is received in a curdled condition. The report cannot be sent for a period of four to six weeks from the time the sample is received, but in the case of other pathogenic organisms the time required is much shorter. Samples to be examined for organisms producing taints in dairy produce should be forwarded to Mr. F. J. LLOYD, F.C.S., 135, Queen's Road, Finsbury Park, London, N. 4.

THE BRITISH DAIRY INSTITUTE, READING.

The British Dairy Institute was established at Aylesbury in 1888, by the British Dairy Farmers' Association, and several hundred Students were successfully trained there in different branches of dairy work. In order that Students might have an opportunity of combining with the practical study of dairying a more complete scientific instruction, the Institute was, in 1896, moved to Reading, and placed under the management of a Committee representing the British Dairy Farmers' Association and the University College, Reading.

The Institute contains large milk-receiving, butter-making, and milk-testing rooms; rooms for the manufacture of pressed, unpressed, and soft cheeses; and rooms for the ripening and drying of different varieties of cheese; besides reading, lecture, and common rooms. It is equipped with the best modern apparatus for the manufacture of dairy produce.

The instruction given is both practical and theoretical, and is arranged to suit the requirements of those who need either elementary or advanced dairy instruction, or who wish to perfect themselves in the manufacture of any special variety of dairy produce, including power-driven separating, pasteurizing, and butter-making plant, a steam turbine separator, and cold storage plant.

The Institute is open throughout the year, except during the Winter Vacation of eight weeks, which commences about the middle of November.

Students may join at any time and for any period.

The manufacture of hard-pressed cheeses extends from March to the end of September, but Stilton and other blue-veined varieties are not made until May.

Soft cheese making is taught during the whole of the time when the Institute is open.

During the winter months (October and November and January to March) instruction is given in buttermaking, clotted-cream making, the testing and analysis of milk, bacteriology, the management of various types of separators, the handling and care of milk, and the preparation of starters, &c. Lectures and demonstrations are usually given in the afternoons, the mornings being chiefly devoted to practical dairy work.

Practical and theoretical instruction in butter-making and cheese-making (including hard-pressed, blue-veined, and soft cheese), £1 per week; £10 for three months; £18 for six months.

Practical and theoretical instruction in buttermaking only, 10s. per week.

A full Prospectus will be sent on application to the Secretary, British Dairy Institute, Reading.

The British Dairy Farmers' Association.

LIST OF MEMBERS, MARCH, 1917

- ABBOT, Richard (Abbot Bros.), Thuxton, Norfolk
 Abbott, Thomas, Wymondham, Norfolk
 Abbott, Edward (Abbott Bros.), Gun Lane, Limehouse, London, E.
 Abbott, Harold Ray, Grange Hill, Chigwell, Essex
 Adams, John, Broomhurst Farm, Fleet, Hants; and 7, Moreton Street, Pimlico, London, S.W.
 Adamson, J., 21, Charterhouse Street, London, E.C.
 Ade, John, Grove Hill Farm, Hellingly, Sussex
 Adeane, C. R. W., Babraham, Cambridge (all communications to A. Eltringham)
 Alexander, Geo., The Barns, Old Church Road, Stepney, London, E.
 Alexander, Reuben C. Lawrence, Model Farm Dairy, Tidey Street, Devons Road, Bromley-by-Bow, London, E.
 Alexandra Separator Co. (represented by Harold V. Hunt), 9-11, Eagle Street, London, W.C.
 Alexander, W., Les Buttes, St. Mary's, Jersey
 Alexander, W. J., Sele Farm, Hertford
 Allsop, Hy., 89, Spencer Street, Birmingham, Warwickshire
 Andrew, A., Uplands, Hawkley, Liss, Hants
 Anslow, Lord, Bangors Park, Iver, Bucks (L.M.)
 Aplin, James Shorland (representing Aplin & Barrett), Yeovil, Somerset
 Appleton, Fife, The Bar House, Beverley, Yorks
 Archer, J., Hill Farm, Ash Priors, Bishops Lydeard, Somerset
 Arkwright, William, Sutton Scarsdale, Chesterfield, Derby
 Armitage, Ziba, J.P., Newton Bank, Preston Brook, Cheshire
 Arnold, Edwin Ross, The Cottage, Maidenhead, Berks
 Ash, Edward C., M.R.A.C., Dallingham Hall, Wickham Market, Suffolk
 Ashby, Joshua J., Brixton Flour Mills, Brixton, London, S.W.
 Ashby, Skidmore, Rivernook Farm, Wraybury, Bucks
 Ashcroft, W., 13, The Waldrons, Croydon, Surrey
 Ashley, Mrs. E., Prospect House Farm, Irlam, Manchester, Lancs
 Assheton, R. C., Downham Hall, Clitheroe, Lancs (L.M.)
 Associated Manufacturers' Co. (represented by L. J. Martin), 72-80, Mansell Street, Aldgate, London, E.C.
 Astley, J. W., Southfield, West Marton, Skipton, Yorks
 Astor, Major the Hon. Waldorf, M.P., Cliveden, Taplow, Bucks
 Atkinson, Mrs. A. E., Clint House, Clint, Hampsthwaite
 Atkinson, Mrs. K. M., Kirkbarrow, Tirril, Penrith, Cumberland
 Atkinson, Richard, 33, Heathfield Road, Wavertree, Liverpool, Lancs
 Atkinson, R. C., Upper Fulbrook, Stratford-on-Avon
 Attwater, J. A., Dry Leaze, Cirencester, Glos
 Austin, Robert, Inglestone, Twynholm
 Avis, A. A., Nungatta Station, Pericoe, New South Wales (L.M.)
 Aylesbury Dairy Co. Ltd. (represented by I. A. Hattersley), 31, St. Petersburg Place, Bayswater, London, W.
 Ayre Brothers (represented by A. Lickiss), The Avenue, High Street, Hull, Yorks

- Ayre, R. S. V., Shepherd's Farm, Rickmansworth, Herts
 BABCOCK, Miss R. B., Bowls, Chigwell Row, Essex
 Bailey, Thomas L., Hartley Farm, Coulsdon, Surrey
 Bailly, J., & Son, 116, Mount Street, W., and Heathfield, Mayfield, Sussex
 Baines, Clement, 121, Lower Addiscombe Road, Croydon, Surrey
 Baker, Benjamin Richard, 31, Barford Street, Islington, London, N.
 Baker, Granville, Hardwicke, Gloucester (L.M.)
 Baker, William Jas., Upper Hale, Farnham, Surrey
 Ballard, Fred, Colwall, Malvern, Wores.
 Banwell, J. W., Home Farm, East Harptree, near Bristol, Glos
 Banyard, Richard, Nelmes Farm, Romford, Essex
 Barbour, G., J.P., Bolesworth Castle, Chester
 Barclay, Edward Exton, Brent Pelham Hall, Buntingford, Herts
 Barham, Colonel Arthur S., Hole Park, Rolvenden, Kent
 Barham, G. Titus, Sudbury Park Farm, Sudbury, Harrow, Middlesex (L.M.)
 Barnard, W., Kelsey Manor Farm, Beckenham, Kent
 Barnes, Henry, 73, St. Helens Gardens, North Kensington, London, W.
 Barnston, Harry, M.P., Crewe Hill, Farndon, Cheshire
 Barr, Peter, Marston Park Farm, Ampthill
 Barry, Lt.-Col. S. L., D.S.O., Pitsford Hall, Northampton
 Barrymore, Lord, Fota, County Cork
 Barton, J. E. R. Noel, West Royd, Kempsey, Worcester
 Bastard, William, Woodlands, Barkby, Leicester
 Bates, Oswald F., 10, Essex Street, Strand, London, W.C.
 Bates, Tom C., Sudbury Dairy Co., Sudbury, Derby
 Batho, Frank, Winston, Ellesmere, Salop
 Bathurst, Captain Charles, M.P., Lydney Park, Gloucestershire
 Bedford, Frank, Dudswell Farm, Northchurch, Berkhamsted, Herts
 Bedford, Geo. Smith, University College, Reading
 Belgravia Dairy Co., Limited (represented by Fred. Pitts, Managing Director),
 2, Exhibition Road, South Kensington, S.W.
 Bell, Colonel, Guernsey (H.M.)
 Bell, John, Cattle Gate Farm, Enfield, Middlesex
 Belmont Stable Supply Co., Ltd. (represented by William Ellis), Experimental
 Farm, Llanidloes, Montgomeryshire
 Bennett, Alfred, Cote Farm, Aust, Tockington, Glos
 Benson, John, The Kettering Dairy, Dalkeith Place, Kettering, Northampton
 Bentall, E. E., Heybridge, Maldon, Essex
 Benyon, J. Herbert, J.P., Englefield House, Reading, Berks
 Bernström, Herr John, Aktiebolaget Separator, Stockholm (H.M.)
 Berry, Grosvenor, Bromley Hall, Standon, Herts
 Bertodano, Baldomero de, Cowbridge House, Malmesbury, Wilts
 Bessborough, Earl of, K.P., 17, Cavendish Square, London, W. 1
 Best, Miss Edith L., St. Andrew's Hall, Reading, Berks
 Bethell, Thomas P., Crown Works, Boundary Place, Liverpool, Lancs
 Betts, Walter, Moreton, Thame, Oxon
 Bewes, Charles, Gnaton Hall, Yealmpton, Devon
 Billson, Mrs. Emily M., The Priory, Martyr Worthy, near Winchester
 Birch, Alfred, Edge Farm, Sefton, via Seaforth, Liverpool
 Birmingham Dairy Co., Limited (represented by W. T. Harrison), Dalton Street,
 Birmingham, Warwickshire
 Blackburn, C., Head Street, Liverpool, Lancs
 Blackburn, George John, Oarside Dairy Farm, Liscard, Cheshire
 Blackstone, G. M. (Blackstone & Co., Ltd.), Rutland Iron Works, Stamford,
 Lincoln
 Blake, Fred, The Home Farm, Nightingale Road, Guildford, Surrey
 Bland, G. R., County Hall, Oxford
 Blickfeldt, Soren Hoy, Cross Deep, Osterley Park Road, Southall, Middlesex
 Blinman, Francis K., The Parsonage, Farrington Gurney, Bristol, Glos
 Blundell, Stanley, Bendish House, Welwyn, Herts

- Blunt, Miss M. S., The Midland Dairy College, Kingston, Derby
 Blyth of Blythwood, Lord, Stansted, Essex
 Blyth, Wilson, Park Farm, St. Osyth, Essex
 Boston, Edgar O., Leeming, Watermillock, Penrith
 Boggild, Professor Bernhard, Frydendalsvej, 2 V., Copenhagen (H.M.)
 Bolitho, Thomas Robins, Trengwainton, Hea Moor, S.O., Cornwall (Agent: W. Cooper, Estate Office)
 Bolton, Herbert James, Waltham Cross, Hertfordshire
 Bourne, Walter Wm., Garston Manor, near Walford, Herts (L.M.)
 Bowden, J. Lancelevy Farm, Sherfield, Basingstoke
 Bradford, William Litter, Pendleton, Manchester, Lancs
 Bradish-Ellames, Mrs. A. G., Manor House, Little Marlow, Bucks
 Bradley, William McKenzie, Greenfields, Horley, Surrey
 Brake, Ernest, Mudford Sock, Yeovil, Somerset
 Brand, Admiral The Hon. T. S., Glynde, Lewes. (Agent, Thos. W. Pickard, Glynde, Estate Office, Lewes, Sussex)
 Brander, Miss Anna E. L. (L.M.)
 Brandon, Joseph, Horton Hall Farm, Leighton Buzzard
 Brandt, A. P., Castle Hill, Bletchingley, Surrey
 Brassey, Capt. R. B., Cottesbrooke Hall, Northampton (L.M.)
 Bray, Miss Evelyn, County Education Office, The Castle, Exeter
 Brazier, Frederick G., Ley House, Grandborough, Winslow, Bucks
 Bridger, Richard, Durleigh Farm, Rogate, Sussex
 Bridges, John H., Ewell, Surrey (L.M.)
 Brigg, Thomas, High House, Addingham, near Ilkley, Yorks
 Briggs, Harold S., Arncliffe, St. Boswells, N.B.
 Brindley, Frank, The Peel Astbury, Congleton, Cheshire
 Bristol Wagon and Carriage Works Co., Ltd. (represented by G. Falconer Fry), Lawrence Hill, Bristol, Glos
 Britch, Edwin, Thorn Brow Farm, Appleton, Warrington, Lancs
 Brittain, Arthur, Horsemoor Farm, Woburn, Beds
 Brocklehurst, W. S., Grove House, Bedford
 Brocq, John Noble le, Broughton Lodge, St. Mary's, Jersey
 Brocq, Ph. le, La Chasse, St. Ouen's, Jersey
 Brodie, George Gordon, Woodlands, The Park, Cheltenham, Glos
 Brodie, W. A. G., Errozie House, Stratherrick, Inverness (L.M.)
 Bromet, John, Golf Links Farm, Tadcaster
 Brooke, Charles E., 206 and 207, Central Poultry Market, E.C. (L.M.)
 Broom, T. W., Soudes Place Farm, Dorking, Surrey
 Broome, Alfred, Windmill Farm, Preston Brook, near Warrington, Lancs
 Broomfield, John, 1, Clitheroe Road, Clapham, London, S.W.
 Broughall, E., Hindford, Whittington, Oswestry, Salop
 Brown, Mrs. Agnes, Hedges Farm, St. Albans, Herts
 Brown, A. E., Staplehurst Poultry Farm, Staplehurst, Kent
 Brown, Edward, 39, Queen Anne's Chambers, Broadway, Westminster, London, S.W.
 Brown Ellis, Quarry Moor, Ripon, Yorkshire
 Brown, E. J., Thornholme, Brigg, Lincs
 Brown, F. C., Barrow Hills, Longcross, Surrey
 Brown, G. B. M., Manor House, Heacham, near King's Lynn, Norfolk
 Brown, H. A., Grendon, Atherstone, Warwickshire
 Brown, James, Talfourd Lodge, Middle Deal Road, Deal, Kent
 Brown, James (representing W. & J. Brown, nurserymen), Stamford, Lincs
 Brown, John, 2, Berkeley Place, Tunbridge Wells, Kent
 Brown, Thomas S., Woodeaton, Oxford
 Brown, W. C., Appleby, near Doncaster
 Browne, W. J., Risebridge Farm, Romford, Essex
 Brownlow, Earl, Ashridge, Herts (Communications to Brownlow R. C. Tower, Bridgewater Estate Office, Ellesmere, Salop)
 Bryan, Frank, 122, Newgate Street, London, E.C. 1
 Buchanan, James, J. P., Lavington Park, Petworth, Sussex

Buckley, T. H. W., The Grange, Crawley Down, Sussex
 Buckley, Wilfred, Moundsmere Manor, Basingstoke, Hants
 Bull, Miss Iris Lillian, The Dairy, Hursley Park, Winchester, Hants
 Bullock, W. D., Stamford Estate Office, Altrincham, Cheshire
 Burdett-Coutts, Wm., M. P., Stratton Street, Piccadilly, London, W.
 Burfitt, John Herbert
 Burfitt, Joseph, Goodedge Farm, North Bruham, Bruton, Somerset
 Burge, Joseph Reginald, Posbrooke, Titchfield, Fareham, Hants
 Burkitt, William, Grange Hill, Bishop Auckland, Durham
 Burnard, A., Torbay House, New Malden, Surrey
 Burnham, Lord, Hall Barn, Beaconsfield, Bucks
 Burton & Holder (represented by W. Burton), 2, Sandland Street, Holborn, London, W.C.
 Butcher, Henry Wm. (representing O'Brien & Butcher), 37 & 38, Mark Lane, London, E.C.
 Butler, Isaac, Brym Gomer, Pontrhydyrun, near Newport, Mon
 Butler, Reginald, Wilts United Dairies, Ltd., Trowbridge, Wilts
 Buxton, Capt., G. J., Tockenham Manor, Wootton Bassett, Wilts
 Burton, Walter, Trinity Poultry Farm, Medstead, Alton, Hants
 Bygott, William B., Rye Hill House, Wing, Oakham, Rutland

CADDICK, Major Edward W., Caradoc, Ross, Hereford
 Caillard, Sir Vincent, Wingfield House, near Trowbridge, Wilts
 Campbell, Sir Archibald N., Bart., Garscube, Glasgow
 Cambray, Miss May, Baunton Farm, Cirencester, Glos
 Candy, T. C., Woolcombe, Cattistock, Dorset
 Candy, W. G., Blagrove Farm, Abingdon, Berks
 Cannell, George W., Hardley, near Loddon, Norfolk
 Carson, Joseph, Crystalbrook Farm, Theydon Bois, Essex
 Carter, Edwd., East Upton, Ryde, Isle of Wight (L.M.)
 Carter, James, & Co. (represented by Gilbert Beale), 237-8, High Holborn, London, W.C.
 Cash, J. E., Brackhill Farm, Redditch, Worcs
 Cathedral Dairy Co. (represented by Loram Bros.), Exeter, Devon
 Cecil, Lady Arthur, The Mount, Lymington, Hants
 Chadborn, Dr. C. N., 10, Cambridge Road, Hove, Sussex
 Chalk, Vernon Beecher, Beckenham, Kent
 Chandler, F., Gratton Cheese Factory, Gratton, Winstar, Derbyshire
 Chandler, H. H., Whitley, Henley-in-Arden, Warwickshire
 Chant, C., Well Farm, Alford, Castle Cary, Somerset
 Chapman, Frederick, Scolecroft Farm, Batley, Leeds
 Chapman, Joseph A., Lane Side Farm, Churwell, near Leeds
 Cheeld, Sydney, Chesham, Bucks
 Cherry, Dr. C. Cummins, Commonwealth Offices, 72, Victoria Street, London, S.W.
 Chevallier, John B., Aspoll Hall, Debenham, Suffolk
 Chick, John H., Wynford Eagle, Dorchester, Dorset
 Chiswick Soap and Polish Co. (represented by Chas. Mason), Chiswick, London, W.
 Chivers & Sons, Ltd. (represented by H. Henshaw), Histon, Cambs
 Clark, Kenneth M., Sudbourne Hall, Orford, Suffolk. (All communications to N. M. Bruce, Estate Office)
 Clarke, Mrs. Agnes M., Brooke House, West Hoathley, Haywards Heath, Sussex
 Clarke, E. H., Cossington Grange, Leicester

- Clarke, E. W., Chilborough House, Aylesbury, Bucks
 Clarke, J., & Sons (represented by Josiah Clarke), 46, Hill Rise, Richmond, Surrey
 Clarke, Col. Stephenson R., C.B., J.P., Borde Hill, Cuckfield, Sussex
 Clarke, T. E., Harwood, near Bolton, Lancs
 Clement, Thomas, jun., 27, South Albion Street, Glasgow
 Coaker, J., Blagdon, Barton, Paignton, S. Devon
 Coats, Miss E. D., Brattles Grange, Brenchley, Kent
 Cobbald, A. H., Eldo House, Bury St. Edmunds, Suffolk
 Cocks, Ernest R., J.P., N.L. Dairy, Saltash Street, Plymouth
 Cole, Henry F., Tilly Manor Farm, West Harptree, Bristol
 Cole, R. D., Department of Agriculture and Technical Instruction for Ireland
 125, Lower Boggot Street, Dublin
 Colin & Co., Ltd. (represented by Fred. Webster), Melton Mowbray, Leicester
 Collings, Right Hon. Jesse, Edgbaston, Birmingham, Warwickshire
 Collins, William, Crafton, Leighton Buzzard, Beds
 Compton, Alfred H., 46, Russell Road, Kensington, London, W. (L.M.)
 Comyns-Lewer, Mrs. E., 6, Oakwood Avenue, Beckenham, Kent (L.M.)
 Connell, Miss May E., 164, Cemetery Road, Ipswich, Suffolk
 Cook, Albert L., Orpington House, St. Mary Cray, Kent
 Cook, Miss E. G., Ashford Farm, Ashford, Middlesex
 Cook, F. E. Arthur (representing F. R. Cook & Co., Ltd.), Victoria Roller Mills,
 Stowmarket, Suffolk
 Cook, William H., The Model Poultry Farm, Orpington, Kent
 Cook, W. W., The Abbey, St. Faith's, Norwich, Norfolk
 Cooke, Harold, Great Homewood, Chailey, Sussex
 Coope, Capt. J. C. Jesser, Bulawayo, Rhodesia
 Cooper, Allan
 Cooper, E. G., Richmond House, Handford Road, Ipswich, Suffolk
 Cooper, Sir George A., Bart., Hursley Park, Winchester (Agent, James E. Thorold,
 Hursley Park Estate Office, Hursley, Winchester, Hants)
 Cooper, Sir Richard A., Bart., M.P., Shenstone Court, Lichfield, Stafford (Agent,
 Frank Webb, Estate Office, Shenstone, Lichfield)
 Coot, Col. Charles H. Eyre, Highgate House, Creaton, Northampton
 Corner, Dr. Harry, Brook House, Southgate, N.
 Cornish, Mrs. C. J., Ergot Villa, Chiswick Mall, W.
 Corrie, Harold, Quobleigh, Eastleigh, Hants
 Cotching, Thomas, Ealing Common, London, W.
 Cowley, William A., Ovingdean Grange, nr. Brighton, Sussex
 Cox, Harry T., Bishop's Stortford Dairy Farms, Bishop's Stortford, Herts
 Cox, James, jun., Manor Road Farm Dairy, Barnet, Herts
 Cox, Miss E. Lillian, Chewton Field Farm, Chewton Mendip, Bath, Somerset
 Cox, Miss L. M., 2, East Grove, Cardiff, Glam
 Cox, William J., The Cardiff Milk Supply, City Road, Cardiff, Glam
 Coxall, Samuel J., Shelford Hall Farm, Hinxton, Cambs
 Crabtree, James, 25-39, Price Street, Birkenhead, Cheshire (L.M.)
 Crawford, Miss A. W., Dairy School, East Anglian Institute of Agriculture,
 Chelmsford
 Crawford, Lady Gertrude, Coxhill, Lymington, Hants (L.M.)
 Crawford, Hugh W. B., Chapmanton, Castle Douglas, N.B.
 Crawford, James B., Caigton, Castle Douglas, Scotland
 Craven, Joseph H., 99, Corporation Street, Manchester
 Cream Dairy Co. (represented by F. W. Bartlett), 27 and 29, Caledonian Road,
 King's Cross, London, N.
 Crewe, Marquis of, P.C., D.C.L., Crewe House, Curzon Street, W. (Communications
 to Prof. W. McCracken, Englesea House, Crewe)
 Crewes, J. F., 13, Lemon Street, Truro, Cornwall
 Croft, J. W., Newport, Widdington, Essex
 Crompton, Chas. W., Hall Green, near Wakefield, Yorks
 Crompton, James R., Brandlesome House, Bury, Lancs

Crowley, Philip, Albury Rectory, Guildford
 Cruttenden, Geo. S., Beaufort Dairy, 90, Bohemia Road, St. Leonards-on-Sea, Sussex
 Cundy, Thomas, The Devonshire Dairy, Benbow Street, Stoke, Devonport, Devon
 Cunningham, John, 1156 Argyle Street, Glasgow
 Curtis, Mrs., Fitznells, Ewell, Surrey
 Curtis, J. L. (Curtis Bros.), Valley Road, Streatham, S.W.
 Cyphers Incubator Co. (represented by A. Robinson), 119-125, Finsbury Pavement, London, E.C.

DALE, William, Mill Hill Farm, Acklam, Middlesbrough, Yorks
 Dalrymple, Miss Mary, Elliston, St. Boswells, N.B.
 Dalrymple-Hamilton, Col. North, Bargany, Girvan, Ayrshire, N.B. (L.M.)
 Dancok's S. S. Model Dairies, Ltd. (represented by Mrs. H. G. L. Stetson Taylor), 177, Fulham Road, Chelsea, S.W. 3
 Dare, Francis E., Halstock, Yeovil, Somerset
 Darlington, Joseph, Stanwardine Farm, Burlton, Salop
 Darrell, Miss Mary, Ebberston, Snainton, R.S.O., Yorkshire
 Daunton, George S., 1, Guilford Street, London, W.C.
 Davies, General H. F., Elmley Castle, Pershore (L.M.)
 Davies & Ransome (represented by E. L. Ransome), 36, Caxton House, Westminster, London, S.W.
 Davis, Colonel, Salt Hill House, Slough, Bucks
 Davis, Lew, 75, George Street, Oxford
 Davy, A. Cedric, Paternoster Row, Sheffield, Yorks
 Dawson, George, Dawson Bros., Leeds, Yorks
 Day, Chas. F. (representing Day & Day), 237-239, Lower Clapton Road, Clapton, London, E. 5
 Day, Charles T., 237-239, Lower Clapton Road, Clapton, London, N.E.
 Day, Son, & Hewitt (represented by G. S. Hewitt), 22, Dorset Street, London, W. (L.M.)
 Deane, Dennis Shepherd, Beaulieu Court Farm, Sunningwell, Berks
 de Bathe, Major Max, Hartley Court, Reading, Berks
 De la Warr, Countess, Buckhurst, Withyham, Sussex
 Dennis, Mrs. Cyril, Broxton Old Hall, Chester
 Derby, Earl of, Knowsley, Prescott, Lancs (all communications to Robert Galbraith, The Home Farms, Knowsley, Prescott).
 Desborough, Lord, K.C.V.O., Taplow Court, Taplow, Bucks
 Deverell, Edgar T., Dormers Leys, Tetsworth, Oxon
 Deverell, H., Bourton, near Buckingham
 Dewar, Sir John A. Bart., Dupplin Castle, Perthshire (L.M.)
 Dickinson, B. O., Beech Hill, Newport, Salop
 Dickson & Robinson (represented by F. Robinson), Cathedral Street, Manchester, Lancs
 Dilworth, H. & Son (represented by Arthur H. Dilworth), Greenroyde, Hest Bank, near Lancaster
 Dixon, Joseph, Spring Grove, near Sheffield, Yorks
 Dixon, Ralph, Tardebigge, Bromsgrove, Worcs.
 Docking, Stanley R., 62, Dingwall Road, Croydon, Surrey
 Doran, William A., Harriestown House, Ardee, Co. Louth, Ireland
 Dorrington & Rickeard (represented by J. W. Rickeard), Scot's Hall, Westleton, Suffolk
 Dougall, Miss Margaret T., Woodlea House, Bonnybridge, Stirling
 Douglas, John, Douglas Wharf, Putney, London, S.W.
 Douglas, L. M., 3, Lauder Road, Edinburgh
 Douglas, Thomas, Douglas Wharf, Putney, London, S.W.
 Dover, J. G., Brightwell Hill, Wallingford, Berks (L.M.)
 Drake, Kendall & Co. Ltd. (represented by H. F. Drake), 29, Seymour Place, London, W.

Drewe, A. S., British Dairy Institute, Reading
 Drummond, Prof. R. J., Dairy School, Kilmarnock, Ayr
 Drysdale, John, Scottish Agricultural Organisation Society, 5, St. Andrew Square, Edinburgh
 Duck, F. A., Moorlands Farm, Midhurst, Sussex
 Dugdale, George, The Manor, Poulton-le-Fykde, Lancs
 Dudgeon, Capt. C. Randolph, Cargen-Holm, Dumfries
 Dugdale, Joseph, Claremont, Blackburn
 Dugdale, J. Marshall, Llwyn, Llanfyllin, Mont.
 Dunn, Fitch Bacon Co., Ltd. (represented by Wm. Hasler), Dunmow, Essex
 Dunn, Archibald, jun., 22, St. James' Road, Barnsbury, London, N.
 Dunn, Henry, 22, St. James' Road, Barnsbury, London, N.
 Dutton, Mrs. Duerdin, Springhall, Sawbridgeworth, Herts
 Du Val, John, La Caroline, St. Peter's, Jersey
 Dyer, Dr. Bernard, B.S., F.C.S., F.L.S., 17, Great Tower Street, London, E.C.

EDLIN, Alfred, Court Farm, Denham, Bucks
 Edwards, Miss Ella, Agricultural Department, University College of North Wales, Bangor
 Edwards, F. C., Grafton Yard, Hampstead Road, London, N.W.
 Edwards, Henry, jun., Holland Road, West Kensington, London, W.
 Edwards, J. W., Fox Hall, Oswestry, Salop
 Edwards, Sidney, Blackbirds' Nest, Bassaleg, Newport, Mon.
 Edwards, Thomas W., Barton, Marlborough, Wilts
 Edwards, W. H., Brookfield Pinhoe, Devon
 Elliott, Sir Thomas H., K.C.B., The Royal Mint, London, E.C.
 Elliott, Wm., 97, Devonport Road, Shepherd's Bush, W.
 Ellison, R., Colonial House, Tooley Street, London, S.E.
 Elphick & Son., Ltd. (represented by S. Elphick), Cliffe, Lewes, Sussex
 Emberton, Thomas, Birch Hall, Ellesmere, Salop
 Emberton, William, Home Farm, Doddington, Nantwich, Cheshire
 Emerton, Frank, 78, Grange Drive, Winchmore Hill, N.
 Emerton, H. J., Woodlands, Chase Side, Winchmore Hill, N.
 Enfield, Viscount, Dancer's Hill, South Mimms, Middlesex
 Enock, Arthur Guy, Thane Works, Fountayne Road, Broad Lane, South Tottenham
 Errington, Roger, Victoria Mills, Sunderland
 Essex, Earl of, Cassiobury, Watford, Herts
 Evans, J. T., Fleur-de-Lis, Gillingham, Kent
 Evans, Miss J. T., Cidgill, Blaenyllos, S.O., Pembrokeshire
 Evans, Richard H., Madryn Castle Farm School, Pwllheli, Carnarvonshire
 Eve, John George, North Ockenden Hall Farm, Romford, Essex
 Evelyn, Mrs. J. H. C., Wotton House, near Dorking, Surrey. (All communications to H. C. Bradshaw, Estate Office, Wotton, Dorking.)
 Evens, John, Burton, Lincoln
 Everest, Miss Ethel Gertrude, Chippens Bank, Hever, Kent (L.M.)
 Everett, Norman, Rushmere, near Ipswich, Suffolk
 Ewing, Hugh, Birtley Farm, Bramley, Guildford, Surrey
 Ewing, M., Ashlands House, Crewkerne, Somerset
 Express Dairy Company, Limited (represented by R. H. Hewson), Tavistock Place, London, W.C.

FALCONER, Mrs. R. A., Stackpole, Pembroke, South Wales
 Farmer, John Thomas Heywood, Langstone, Moretonhampstead, Devon
 Farmer, Samuel Wm., Little Bedwyn, Wilts

Farmers' and Cleveland Dairies Company, Limited (represented by J. T. Horner),
12 and 13, East Street, Gifford Street, Caledonian Road, London, N.
Farwig, H. A., Mapleton Dairy Company, Mapleton Farm, Edenbridge, Kent
Fawkes, Algernon, Wolley, Wakefield, Yorks (L.M.)
Fawkes, F. H., Farnley Hall, Otley, Yorks
Fellowes, Rt. Hon. Sir Ailwyn, K.C.V.O., Honingham, Norwich, Norfolk
Finch, Bernard, Flitwick, Beds
Fiske, George, Thornbush, Bramford, Ipswich, Suffolk
Fison, Joseph, & Co., Ltd. (represented by H. M. Ennals), Ipswich
Fitzhardinge, Lord, Berkeley Castle, Gloucester (Agent, James Peter, Estate Office)
Follows, A. J., Metchley Park, Edgbaston, Birmingham, Warwickshire
Ford, J. Stranger, The Manor House, Weston, Honiton
Forester, Capt. F., M.F.H., Saxelbye Park, Melton Mowbray
Formby, Wm., The Cedars, Stratton St. Michael, Long Stratton, Norfolk
Forster, Miss Jane, Dairy Institute, Worleston, Nantwich, Cheshire
Fortescue, Earl, Castle Hill North Devon (L.M.)
Fortune, Robert, Newhouse, Cranleigh, Surrey
Four Oaks Spraying Machine Co. (represented by W. C. G. Ludford), Four Oaks,
Sutton Coldfield, Birmingham, Warwickshire
Fowler, W. Herbert, J.P., Claremont, Taunton, Somerset (L.M.)
Fowler and De la Perrelle (represented by T. W. Bridger), Porters Lane, near Royal
Pier, Southampton, Hants
Fox, Robert, Grove Hill, Falmouth, Cornwall (L.M.)
Francis, Thomas, 34, High Street, Tunbridge Wells
Freckleton, F. S., Narborough Wood, Enderby, Leicester
Freeth & Pocock (represented by Sir Sidney J. Pocock, J.P.), 116, High Road,
Streatham
Freeth, F. H., Rosenheim, 81, West Hill, Putney, S.W.
Freeth, H. F., Cheyleswood, Langley Park, Mill Hill, London, N.W.
Fremlin, Walter T., Milgate Park, Maidstone, Kent
French, James Thomas, Crystal Palace Dairy, Norwood, S.E.
Frost, Albert, Fox Farm, Sanderstead, South Croydon, Surrey
Frowd, Herbert H., 16, Seaside, Eastbourne, Sussex
Fuller, Robert F., Great Chalfield, Melksham, Wilts (L.M.)
Fullwood & Bland (represented by Charles Bland), 31, Bevenden Street, Hoxton, N.
Furneaux, F., Perry Barton, Totnes, S. Devon

GAMAGE, A. W. (represented by John S. Parker), Horticultural Dept., Holborn, E.C.
Gardner, Mrs. Chas. H., Rectory Farm, Pulloxhill, Amptill, Beds
Garne, W. T., Aldsworth, near Northleach, Glos (L.M.)
Garrad, George H., Wye College, Kent
Garrard, F. R., The Hall, Framlingham, Suffolk (L.M.)
Gates, B. F. J., Wing Park, Wing, Bucks
Gatty, Albert A., Bannister Hall, Walton-le-Dale, near Preston, Lancs
Gavin, William, Blenheim Home Farm, Woodstock
Gibbons, Henry H., Church Farm, Clutton, Bristol
Gibson, A., Yarrow, Haywards Heath, Sussex
Gibson, T., Eldenhope, Hadley, Barnet
Gilbert, C. E., Hillside, Denstone, Staffs.
Gilbert, F. W., The Lawn, Chellaston, Derby
Gilbertson & Page, Ltd. (represented by Frank Page), Hertford, Herts
Gilderson, Robert, jun., Coach Works, High Road, Ilford, Essex
Giles, Henry, Stockers Farm, Rickmansworth, Herts
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N.B.—Members having any alterations to make in the Names and Addresses, as published in this List, are requested to give notice of the same, in writing, to the Secretary.

ABBREVIATIONS—(H.M.) Honorary Member. (L.M.) Life Member.

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